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« Damaging the Perfect Image of Athletes:
How Sport Promotes Envy »

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Damaging the perfect image of athletes: How sport promotes envy.

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Abstract:

We explore the behavioural and affective differences between subjects practicing sport activities and subjects not practicing sport. Are athletes more distressed by unfavourable social comparisons and more prone to engage in hostile behaviour than non-athletes? Using experimental methods, we investigate the connection between sport practice and antisocial behaviour. In our experiment we capture the satisfaction subjects derive from unflattering social comparisons by asking them to evaluate their satisfaction after being informed of their own endowment and after being informed of their opponent's endowment. Then subjects can decide to reduce their opponent's endowment by incurring a cost. We observe that sport plays a key role on both individual well-being and behaviour: 1) sport practice amplifies the negative impact of unfavourable social comparisons on individual well-being and 2) sport practice exerts subjects to reduce others' income. Besides the satisfaction sporty subjects report from social comparisons predicts their decisions to reduce others' income. Finally we provide empirical evidences suggesting that envy affects significantly athletes' satisfaction and behaviour.

Key words: Sport, Envy, Subjective well-being, Real-Effort, Antisocial behaviour, Income inequality, Happiness, Interdependent preferences.

JEL classification: C91, D03, J0, Z19.

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1. Introduction

Imagine the two following situations: A and B. Situation A involves two students named Bob and John. They are studying in order to pass an entrance examination in a prestigious university. Bob succeeds in the examination and joins the university whereas John fails the examination and does not join the university. Situation B is also a dyadic one involving two athletes: Tom and Jack. They are passing a trial for being selected for the national team to participate in the next Olympic Games. Tom realizes a good performance and gets selected whereas Jack makes a poor one and fails being selected. Whereas the two situations involve different protagonists and environments, they expose subjects to either upward or downward social comparisons. In both situations, John and Jack fail at achieving their objectives. They both suffer from their failures and are exposed to unflattering social comparisons. Attending the success of their rival is ought to amplify their pain. The question is now the following: which one (John the student or Jack the athlete) will be more distressed by his situation and will be more likely to engage in an hostile attitude (e.g. malicious whispers, sabotage, aggression) toward his successful rival? Through this paper, we argue and confirm that the answer would be Jack the athlete!

Sport is good! This is what most people would say concerning sport. Despite its obvious benefits on health, sport practice embodies positive values: it helps in developing self-control, contributes in maintaining or increasing both self-esteem and self-confidence and has been shown to improve emotional and cognitive skills such as problem-solving (Collis and Griffin, 1993; Danish and Nellen, 1997; Novick and Glasgow, 1993; Oman and Duncan, 1995; Reid et al., 1994; Ryckman and Hamel, 1995; Siegenthaler and Gonzalez, 1997; Svoboda, 1995; Ykema, 2002). Besides sport constitutes an advantage when entering in the job market. Several studies convey that people who have been practicing sport during their scholarship (high school or university) earn, on average, a superior income than non-sporty people (Barron et al., 2000; Ewing, 1995, 1998; Long and Caudill, 1991). The most recent study is the one by Barron et al. (2000). The authors find that sport practice during scholarship does not increase the probability of getting a job position. Nevertheless they confirm that former sporty students receive, when getting a job, a superior salary than former non-sporty people.² Finally sport is considered to be a useful intervention strategy in reducing antisocial behaviour. Morris et al. (2003) show that most Australian organizations about youth develop sporting activities with the aim at reducing youth antisocial behaviour (i.e. drug consumption, crime, suicide, self-

² See Eber (2002) for a review of the existing literature on the sport advantage on the job market (i.e. “*athlete premium*”).

harm...). In spite of the benefits conveyed by sport activities, there is to our knowledge a lack of robust evidence of the direct impact of sport (and more generally of physical activity) on antisocial behaviour.

On the other hand, the behaviour of sporty people has recently received much attention from researchers. Scholars convey that athletes are very sensitive to social comparisons.³ Indeed social comparisons play a key role in sport and more generally in everyday life.⁴ Social comparisons are invasive and people use them so as to build inferences about themselves, to manage their emotions and to protect their self-esteem (Ben Ze'ev, 1992, 2000; Buunk and Gibbons, 1997; Festinger, 1954; Heider, 1958; Suls and Wills, 1991). Social comparisons have important consequences on subjects both from an affective and a behavioural perspective. Collins (1996) convey that upward (resp. downward) social comparisons have a negative (resp. positive) affective impact (see also Testa and Major, 1990; Lockwood and Kunda, 1997). Competitive settings gather all elements required to amplify the impact of social comparisons on athletes both from an affective and a behavioural perspective. Bardel et al. (2010) precise that *“Sport competition provides a situation in which social comparison is present and where the feeling of being approved, evaluated and appreciated by others could be threatened in case of failure”* (p. 172). Social comparisons constitute for athletes a necessary device so as to evaluate their own and others' performance levels. Recent studies tend to suggest that athletes are more sensible to social comparisons and hence more affected by the diagnostic they derive from the latter (i.e. success/failure or superior/inferior). Wilson and Kerr (1999) observe, among rugby players, that postgame losers are less grateful and satisfied than winners and they experience more unpleasant emotions. Bardel et al. (2010), concerning tennis players, find that subjects' satisfaction shrinks largely after failure whereas no significant differences are observed after success. Bardel et al. (2010) conclude that failure has more impact on athletes' affective responses than success.

Why such observations? According to both philosophers and psychologists a competitive environment is a situation prone to generate specific negative emotions like envy. Envy can be roughly defined as *“a disturbing pain excited by the prosperity of others”* (Aristotle, *Rhetorics*, Book. II, Chap. IX, 1386b). Envy is a negative emotion because it is an unpleasant experience (i.e. characterized by pain, sadness, ill-will...) and it can exert the subject to engage in hostile actions toward the object of envious feelings (Ben Ze'ev, 1992, 2000; Celse, 2010; D'Arms and Kerr, 2008;

³ By using the term *“athletes”* we refer to subjects practicing sport. In this paper, we use the terms *“sporty”* and *“athlete(s)”* as if they were interchangeable.

⁴ Wood (1996) defines social comparison as the process of thinking about information about one or more other people in relation to the self.

Smith and Kim, 2007).⁵ An agent is likely to envy only those with who he can engage competition: “*one envies one’s rivals*” (quoted from D’Arms and Kerr, 2008, p. 43). Indeed envy seems to be more present and experienced more intensively in competitive situations. All ingredients required to trigger envy are gathered in competitive settings: at least two persons sharing similar characteristics and objectives and one good whose provision is limited and whose property is exclusive. Hence having the good places the rival (i.e. object of envious feelings) above the subject. Aristotle emphasizes the importance of competition in envy by writing: “*We compete with those who follow the same ends as ourselves: we compete with our rivals in sport or in love, and generally with those who are after the same things; and it is therefore these whom we are bound to envy beyond all others. [...], we envy those whose possession of or success in a thing is a reproach for us* (1941, *Rhetoric*, Book. II, Chap. X, 1388a).⁶ Athletes interact in a competitive setting: they always have to challenge other athletes so as to secure or to improve their position. As a consequence athletes are in close contact with envy and might be more prone to be consumed with the latter than non-athletes. As envy includes so negative consequences, it might be tempting to assume that athletes are more likely to engage in hostile attitude and behaviour toward their rival.

As a consequence it would be tempting to argue that sporty subjects (i.e. subjects practicing sports) are more prone to be consumed by negative emotions generated by social comparisons (e.g. disappointment, envy, anger) than non-sporty subjects and to engage in negative behaviour (e.g. sabotage, aggression...) through the influence of these dark emotions. There is, to our knowledge, no empirical evidence of such observation. Few economic experiments were ruled with athletes. Eber and Willinger (2004) compare decisions from sporty and non-sporty subjects in a non-monetary ultimatum game.⁷ The authors observe that sporty subjects accept significantly lower offers than non-sporty ones. Eber (2006) asks subjects to answer to different hypothetical questions and compare decisions from subjects practicing sport activities with decisions from subjects not practicing sport.⁸ He observes that sporty tend to behave differently from non-sporty subjects. He

⁵ The hostility inherent in envy can be communicated through a variety of ways : from a « hostile » look to sarcastic comments and even to physical aggressions (see Parrott and Rodriguez Mosquera, 2008).

⁶ See also Bacon (2005), Ben Ze’ev (1992, 2000) and D’Arms and Kerr (2008) for further explanations about the pervasiveness of envy in competitive settings.

⁷ Eber and Willinger (2004) and Eber (2006) define a sporty subject as a subject having a licence in a club.

⁸ Subjects have to tell how they would react in two different situations. In situation A, subjects are walking down the street and find 10 bills of 10€. They have to indicate how much of this amount they would give to a stranger who also noticed the bills but arrived lately. Eber (2006) observe that sporty girls give significantly more money to the stranger than non-sporty girls. Conversely sporty boys give less money than non-sporty boys but the difference is not significant. In situation B, subjects have to choose among two distributions of income between them and a fictitious colleague. In the first distribution (unequal distribution), the subject gains 600€ whereas the colleague gains 800€. In the second distribution (equal distribution), both the subject and the colleague gain 500€. Eber (2006) find that sporty girls choose significantly more often the equal

also underlines a gender effect: sporty girls tend to be more sensitive to inequalities (i.e. they are more generous and choose more often the equal distribution than non-sporty girls) and sporty boys tend to maximize more their own situation (i.e. they give less and choose more often the unequal distribution than non-sporty boys). Although behavioural differences between sporty girls and non-sporty girls are significant, Eber (2006) does not find any significant differences between decisions from sporty boys and non-sporty boys.

Are athletes more distressed by unflattering social comparisons than non-athletes? Are athletes more likely to be consumed with negative emotions triggered by disadvantageous social comparisons? And finally are athletes more prone to adopt antisocial behaviour (i.e. undertake actions aiming at damaging the situation of their rivals) than non-athletes when exposed to unfavourable social comparisons? We aim at shedding light on the direct impact of sport on antisocial behaviour. Does sport practice amplifies or lessens negative behaviour (i.e. damaging others' situations)? We implement an experimental protocol in order to investigate the affective and behavioural differences between sporty and non-sporty subjects when they face unfavourable social comparisons. We claim that athletes are more prone to be consumed by envy and thus have a higher probability to engage in hostile behaviour against their rivals than non-athletes.

To fulfil our purpose, we analyse subject's reactions to unflattering social comparisons in two steps. First we compare the affective differences between sporty and non-sporty subjects by measuring the impact of unflattering social comparisons on subjects' satisfaction. To do so, subjects are asked to evaluate their satisfaction after being informed of their endowment and after being informed of the endowment of another paired player (opponent thereafter). Standard economic theory relying on the *Homo Economicus*' concept states that individual satisfaction depends exclusively on individual income. Thus standard economic theory predicts that subjects will not report changes in their satisfaction after being informed of their opponent's endowment. Conversely, by reporting changes (whether positive or negative) a subject can indicate to be affected by social comparison. The subject can report positive changes in satisfaction (e.g. altruism, solidarity) or negative changes in satisfaction (e.g. envy). Then we compare the behavioural differences between athletes and non-athletes. After being exposed to social comparison, subjects are informed that they can choose to reduce their opponent's endowment. We compare reduction decisions from sporty subjects with those from non-sporty subjects.

distribution than non-sporty girls whereas sporty boys choose more often the unequal distribution than non-sporty boys. Again the difference between boys is not significant.

To give a preview of our results, we observe major differences between sporty and non-sporty subjects. First unflattering social comparisons have a significant negative effect on athletes' satisfaction and not on non-athletes. Then the practice of sport activity modulates subjects' decisions to reduce others' income. Indeed sporty subjects engage significantly more reduction decisions than non-sporty ones. We do not find any gender effect.

The paper is organised as follows. The next section provides a description of the experimental protocol we use in the paper. We detail our research hypotheses in section 3. Section 4 is devoted to introduce our results. The last section offers a discussion and concludes.

2. Experimental design

In this section, we detail the experimental design. We first describe the game and then we present the procedures we use so as to catch sport variables.

a. Description of the game

Experimental sessions were conducted in spring 2010 at the LEEM.⁹ Subjects were randomly recruited in a voluntary pool of subjects including more than 4000 candidates for experiments. Subjects were mainly students from both sexes, different ages and universities (scientific or not). We ruled 10 sessions and 150 subjects participated in our experiment.

We phrased both instructions and game as neutrally as possible (i.e. avoiding any suggestive terms such as opponent, destruction...). All instructions were computerised and displayed during the experiment. We chose to display instructions during the experiment for three main reasons: First because we did not want subjects to know that they will evaluate their satisfaction and so to anticipate their future satisfaction. Second because the game was very easy to understand and thus could be made in very brief time (average time was 35 minutes for a session including payment). And third in order to amplify emotions created in the laboratory. As instructions were displayed step by step, we could not check subjects' understanding of the procedures. Nevertheless, subjects were, at the beginning of the experiment, informed that they could, at every moment of the experiment, ask privately understanding questions to a monitor by raising their hands.

Participants were randomly assigned to one of the two possible roles: player A and B. Roles assignments were kept constant throughout the experiment. There was an identical number of

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players A and B in each session. After roles assignment each player A was randomly paired with a player B. All subjects knew, at the beginning of the experiment, that endowments ranged from 4€ to 32€ (in integer amounts) and that endowments were attributed according to their individual performance on a task.¹⁰ The task consisted in clicking on a mouse under time pressure (1 minute): the more they clicked the higher their endowment. Subjects knew that they will be informed of their own performance (i.e. number of clicks made) after the one-minute time limit. Subjects were also informed that only participants in the role of player A could make a decision and had to participate in the next steps. In our paper, we focus on unflattering social comparisons so we restrict our analysis to observations from players A whose endowments are inferior to players B's endowments. Besides as we aim at disentangling the impact of social comparisons on both individual well-being and behaviour, it is important to avoid any strategic interaction in the experimental design (i.e. negative reciprocity, retaliating behaviour).¹¹ While players A were doing the experiment, players B were invited to remain silent and were only informed of their final payoff (they were not informed about the decision players A could make). Note that although all players were informed that endowments depended on individual performance, they ignored that endowments also depended on roles. Players A could receive an endowment of 4€ or 16€ whereas players B could receive an endowment of 8€, 20€ or 32€ depending on the number of clicks they personally made.¹²

From now, we will present the procedures players A had to fulfil. Note that players A had to confirm each decision they took.

The experiment was single shot and consisted in a succession of six steps (only players A are concerned with these steps). Before these six steps, all players were informed about their role and had to perform the "clicking" task so as to determine their endowments.

Step 1: Each player A was informed about his monetary endowment expressed in Euros.

Step 2: Player A was invited to evaluate and to report his satisfaction level relative to his endowment.¹³ To do so, subjects were asked to move a slider on a graduated scale ranging

¹⁰ We insisted on the fact that endowments only depended on individual performance so as to avoid any idea of competition between players.

¹¹ In this paper we use the terms "*well-being*" and "*satisfaction*" as if they were interchangeable.

¹² Thanks to pilot sessions we could set a certain number of clicks as thresholds in order to determine subjects' endowments. More precisely above 230 clicks players A obtained 16€ and below that threshold they obtained 4€. Concerning players B we established two thresholds: below the first threshold players B received 8€, between the first and second thresholds they received 20€ and above the second threshold they received 32€. Thresholds were kept constant in all sessions. We replicated the procedure used by Celse (2010).

¹³ The use of self-report methods is acknowledged to be a reliable method. First, methods based on self-report measures are often used by emotion theorists and recurrent in happiness research and psychology. Second, the satisfaction evaluation procedure did not affect subjects' payoffs. Thus there were neither financial

from -50 to +50. At the left extreme of the scale (-50), the slider indicated the state “*Extremely Dissatisfied*” and at the other extreme (+50) the slider indicated the state “*Extremely Satisfied*”. The middle position was valued by 0 and indicated “*Neither satisfied nor dissatisfied*” (see appendix). The value of the slider was indicated in a table.

Step 3: The endowment of player B was communicated to player A, revealing that their own endowment is lower.

Step 4: Player A was asked again to evaluate his satisfaction, by using the same device as in Step 2.¹⁴

Step 5: Each player A was informed that he has the opportunity to reduce player B’s endowment. If player A decided not to reduce player B’s endowment the experiment ended and each member of the pair received his endowment as a final payoff. If player A decided to reduce player B’s endowment, the game moved to Step 6. At this stage of the game, the player was neither informed about the cost of reducing the opponent’s endowment nor the amount of reduction. We chose to do so in order to differentiate subjects who were willing to reduce others’ income from those who were not.

Step 6: Player A had to indicate by how much he wanted to reduce player B’s endowment. Player A had to choose an integer amount between 1 to 10 units. As the subject must confirm his decision by clicking on a button, player A clearly announced his willingness to reduce his opponent’s endowment. As a consequence we did not allow null reductions. Each possible amount cut player B’s endowment by some fraction (see Table 4.1) and involved a cost for player A. If player A chose the maximum of 10 units, the final payoff of the two players were equalized. For a lower amount, player B’s payoff remained larger than player

incentives for subjects to report to be satisfied or dissatisfied nor incidence of their reported satisfaction (or dissatisfaction) on subjects’ payoffs. Third, recent studies have proved that results provided using self-report methods are supported, and thus reliable, by results supplied using physiological measures (Ben-Shakhar et al., 2007). Finally, Kahneman and Tversky (1979) argued that “*subjects have no special reason to disguise their true preferences*” (p. 265).

¹⁴ Satisfaction reports might have been different if we reverse the order of evaluations (first asking the satisfaction level after being informed of the opponent’s endowment and then after being informed of his own endowment). But we chose this procedure for two main reasons. First because the procedure correctly identified the impact of social comparisons on individual well-being. Then because we used to catch the impact of social comparisons on individual well-being a very similar procedure to the one used by Miles and Rossi (2007). In order to test for an order effect, the authors reverse the order of the questions and find that, whatever the order used, results remain robust. They replicate this procedure in two different countries and find no significant differences.

A's payoff.¹⁵ The amount of reduction and the cost for reducing varied depending on the scenario subjects were placed in (see Table 4.1). We set the cost of reduction so as to allow comparisons in terms of reduction decisions engaged between players A. To fulfil that purpose, the cost of reduction represented the same weight in player A's initial endowment for each subject. Then in order to reduce his opponent's endowment by one unit each player A had to sacrifice 2.5% of his initial endowment. Hence to equalize endowment, each player A had to give 25% of his initial endowment. Player A could simulate the impact of his decision on the final payoffs of each member of the pair.

At each step, a table indicated subjects' decisions given at previous steps (subject's endowment, the value given at first evaluation, etc...).

As players A could only obtain 4€ or 16€ and players B 8€, 20€ and 32€ and as we focus on unfavourable situations (i.e. when player A has an inferior endowment), there are only 5 possible scenarios (labelled scenario A, B, C, D and E): (4€; 8€), (4€; 20€), (4€; 32€), (16€; 20€) and (16€; 32€). All scenarios are presented in Table 4.1. We exclude from our analysis data from the scenario (16€; 8€).¹⁶ Thanks to these five allocations we can disentangle the impact of absolute inequalities (referring to the gap between players' endowments measured in absolute terms) from the impact of relative ones (referring to the gap between players' endowments measured in relative terms) on both individual well-being and behaviour (see Celse, 2009, 2010).¹⁷

Table 4. 1: Parameters used in the experiment.

Scenario	Player A's endowment	Player B's endowment	Absolute difference	Relative difference	Cost of reduction	Amount of reduction
A	4€	8€	4	2	-0.1xe	-0.5xe
B	4€	20€	16	5	-0.1xe	-1.7xe
C	4€	32€	28	8	-0.1xe	-2.9xe
D	16€	20€	4	1.25	-0.4xe	-0.8xe
E	16€	32€	16	2	-0.4xe	-2xe

Note: e represents the amount invested by the subject in reduction decisions, $e \in [1; 10]$. The cost of reduction represents the cost players A had to give for each unit invested in reduction decisions (for each e). The amount of reduction captures by how much player B's endowment decreases for each unit invested in reduction decision. Then, in scenario C, a player A

¹⁵ In order not to exert subjects to invest the maximum allowed, it is important to prevent players A from having a superior payoff than players B. Thus even if players A invested the maximum allowed, they could not have a superior payoff but could restore equality.

¹⁶ Note that subjects could only participate in one scenario.

¹⁷ Then absolute difference (D_A thereafter) equals to (*Player B's endowment* – *Player A's endowment*) and relative difference (D_R afterwards) corresponds to (*Player B's endowment*/*Player A's endowment*).

willing to invest 4 units in reducing player B's endowment will have to incur a cost of 0.4€ (4×0.1) and player B's will incur a loss of 11.6€ ($4 \times (-2.9)$).

b. Description of the sport variables

We now briefly detail how we captured and measured sport variables. At the end of the experiment, subjects were asked to answer to a computerized questionnaire. The questionnaire contained socio-demographic questions as well as open questions (i.e. subjects had to write with their own words their answers) concerning subjects' choices and decisions during the experiment (how did they evaluate their satisfaction? Why did they decide to reduce their opponent's endowment?). Whereas subjects were not forced to answer to open questions, they had to fulfil socio-demographic ones so as to be paid. Socio-demographic questions included classical questions (age, sex, whether the subject is a student or not...) and questions relative to sport. We choose not to replicate the procedure used by Eber and Willinger (2004) and Eber (2006) to elicit sporty subjects. Quoted authors only ask subjects if they had a licence in a club and consider a sporty subject as a subject having a licence. Using that procedure they cannot disentangle the impact of practicing a sport from the impact of participating in competitions on subjects' decisions. We choose to differentiate these two elements and to investigate the impact of each element on subjects' satisfaction and behaviour. The first question about sport was sentenced as the following: "*Do you practice a sport in a club?*". The variable *Sportpractice* refers to the answer relative to this question.¹⁸ If the subject answered yes, he had to answer to new questions relative to the sport, if not the questionnaire ended. By signalling to practice sport then the subject had to specify the sport he practiced ("*Indicate the sport you practice*"). The question was open and the subject could give every sport he wanted. The subject had to specify since when he's been practicing the sport ("*Indicate since when you practice the sport*"). The variable *Sporttime* catches the response relative to this question. To do so he had different choices ranging from "*a few months*" to his current age. Next he had to indicate whether he considered the sport he practiced as an individual or collective one ("*Indicate whether you consider the sport you practice as an individual or collective one*"). Variable *Sporttype* refers to this question. The subject had also to mention whether he participated in competitions ("*In your sport, do you participate in competitions?*"). Variable *Sportcompetition* captures the answer. Concerning this last question, he had to precise the level of the competition (local, regional, national or international). Variable *Sportlevel* catches the reply. The variable *Sportpractice* captures whether the subject practices sport activities or not. We consider a sporty subject (or athlete) a subject who declares to practice a sport. The subject may practice sport but he may not participate in competitions. Due to

¹⁸ Details about the coding of each sport variable are supplied subsequently.

the lack of empirical evidences concerning the connection between envy and sport, we still ignore whether envy is experienced intensively by practicing sport or by participating to competitions. So we disentangle the practice of sport activities (by referring to *Sportpractice*) from the participation to competitions (by referring to *Sportcompetition*).

3. Behavioural predictions

In this section, we develop the research hypotheses we aim at exploring with our experiment. We split up our research hypotheses into two parts. The first part is related to expected results concerning individual satisfaction whereas the second one is devoted to research hypotheses concerning individual behaviour (i.e. individuals' decisions to reduce others' income). From now, we refer to players A and B by using respectively the terms "*subjects*" and "*opponents*".

a. Social comparisons and individual well-being

H1a: Exposure to social comparisons affect individual satisfaction.

Social comparison is a deep rooted human behaviour and have a key role on determining self-evaluation and self-esteem. Social comparisons help in building inferences about one self, contribute to ability assessments, evaluate one's opinions and also help to manage emotions (Ben Ze'ev, 2000; Collins, 1996; Festinger, 1954; Heider, 1958; Suls and Wills, 1991). Social comparisons can have a positive impact on self-evaluation and self-esteem when they lead to a flattering diagnostic (e.g. success or superiority) but they can alter dramatically one self-evaluation and self-esteem if they lead to an unflattering diagnostic (e.g. failure or inferiority). Besides they also have a key role on determining individual satisfaction (Michalos, 1985). Finally, previous results from happiness studies (Clark and Oswald, 1996; Ferrer-i-Carbonell, 2005; Luttmer, 2005) and from experimental investigations (Celse, 2009, 2010; Miles and Rossi, 2007) convey that social comparisons affect significantly individual well-being. Hence whereas standard economic theory predicts that individual well-being depends solely on individual income, we conjecture that learning about the opponent's endowment will significantly affect subjects' satisfaction. Thus we assume that there will be significantly more subjects reporting changes in their satisfaction after exposure to social comparison than subjects not reporting changes in their satisfaction.

H1b: Unflattering social comparisons affect negatively individual satisfaction.

Besides, as pointed out by Collins (1996), upward social comparisons (i.e. from bottom to top) generate negative affects whereas downward social comparisons (i.e. from top to bottom) generate positive affects. Evidences about the negative impact of unflattering social comparisons are supplied by Testa and Major (1990). The authors observe that exposure to unfavourable social comparisons provokes depressive and hostile reactions. Results from experimental investigations (Celse, 2009, 2010; Miles and Rossi, 2007) also corroborate the negative affective consequences of disadvantageous social comparisons. Quoted authors reveal that individual well-being shrinks after exposure to upward social comparison. Relying on these results, we conjecture that a confrontation to unfavourable social comparison will impact negatively individual satisfaction. Hence after exposure to unfavourable social comparison, the proportion of subjects reporting a decrease in their satisfaction will be significantly higher than the proportion of subjects reporting an increase in their satisfaction.

H1c: Unflattering social comparisons have a larger negative effect on athletes' satisfaction.

As mentioned above, results from previous studies tend to suggest that athletes are more sensitive to social comparisons. They also show that unfavourable social comparisons (i.e. inferiority or failure) have a significantly negative effect on athletes' satisfaction and self-esteem (Bardel et al., 2010; Wilson and Kerr, 1999). Besides both philosophers and psychologists state that envy is more present in competitive environment. They also suggest that competitive settings amplify the impact of envy on individuals: in competition, subjects are more prone to be consumed by envy (Aristotle, 1941; Bacon, 1601; Ben Ze'ev, 1992, 2000; D'Arms and Kerr, 2008). We capture envy by measuring individual satisfaction after being informed of one's own endowment and after being informed of the opponent's endowment.¹⁹ As mentioned previously, envy can be roughly defined as a form of painful sadness triggered by the awareness of others' good fortune (Aristotle, 1941; Ben Ze'ev, 1992, 2000; Celse, 2010; D'Arms, 2002; D'Arms and Kerr, 2008; Micelli and Castelfranchi, 2006; Smith and Kim, 2007). Thus when a subject reports a decrease in his satisfaction after being exposed to social comparison, he indicates to experience envy. In our experiment, envy can explain why subjects report negative changes in their satisfaction after learning their opponent's endowment. Hence, as athletes are more prone to be consumed by envious feelings, we conjecture that the proportion of athletes reporting a decrease in their satisfaction will be significantly higher than the proportion of non-athletes reporting a decrease in their satisfaction after exposure to social comparison.

¹⁹ In this paper we define envy in terms of satisfaction. The notion of envy we use refers to the decrease in individual well-being when one perceives others' higher situations.

b. Social comparisons and individual behaviour

H2a: Social emotions induce behaviour and explain reduction decisions.

Whereas standard economic theory neglects the role of emotions on individuals' behaviour, scholars highlight the impact of emotions on individuals' decisions (Elster, 1998; Hume, 1991). Recent experimental studies convey that emotions drive subjects' behaviour. Bosman and van Winden (2002) report that emotions in a power-to-take game explain responders' decisions to destroy their own income (see also Bosman et al., 2005 or Sanfey et al., 2003).²⁰ Reporting changes in satisfaction after exposure to social comparison might be considered as a signal that the subject is experiencing social emotions.²¹ Reporting positive changes in satisfaction can signal positive emotions (e.g. altruism) and reporting negative changes in satisfaction is ought to indicate negative emotions (e.g. envy). Then we conjecture that, in our experimental design, decisions to reduce others' income result from the impact of social emotions. In other words, the proportions of reduction decisions engaged by subjects reporting changes in their satisfaction will be significantly higher than the proportion of reduction decisions engaged by subjects not reporting changes in their satisfaction.

H2b: An athlete is more prone to engage in reduction decisions rather than a non-athlete.

Researches on athletes tend to suggest that social comparisons have a significant impact on athletes' behaviour and emotional state. Besides it sounds like unfavourable social comparisons affect more athletes' self-esteem and self-evaluation than favourable ones (Bardel et al., 2010; Wilson and Kerr, 1999). Recently Bardel et al. (2010) observe that failure generates a deep shrink in athletes' satisfaction whereas success has no significant effect on their satisfaction. It seems then plausible that if unfavourable social comparisons have so negative effects on sporty subjects they can exert athletes to behave negatively by pushing them to engage reduction decisions. Conversely unflattering social comparisons might not have enough impact on non-sporty subjects to induce them to reduce income. Besides as developed previously, envy seems to be pervasive in competitive settings. Sporty subjects interact in such settings and might be victims of envy. Consumed by envy, athletes are ought to be prone to engage in reduction decisions so as to satisfy their envy. Then we

²⁰ In the power-to-take game, the take authority (P1 afterwards) receives an income Y_{P1} and is associated to a responder (P2 afterwards) with an income Y_{P2} . The game consists of two stages. In the first stage, P1 decides on a take rate $t \in [0, 1]$, which corresponds to the part of P2's income left after the second stage that will be transferred to P1. In the second stage, after being informed on the value of t P2 decides on $d \in [0, 1]$, which corresponds to the part of Y_{P2} that will be destroyed. Thus the payoff for P1 is equal to $Y_{P1} + t(1 - d)Y_{P2}$ and the payoff for P2 is thus equal to $(1 - t)(1 - d)Y_{P2}$. In Bosman and van Winden (2002) and in Bosman et al. (2005), respondents are asked, after their decision, to report their emotions on a list including several emotions.

²¹ Emotions can be roughly split up into two families: private emotions (e.g. joy, regret) and social emotions (e.g. envy, jealousy). Conversely to private emotions, social ones are triggered by social comparisons.

assume that the proportion of reduction decisions engaged by sporty subjects will be significantly higher than the proportion of reduction decisions engaged by non-sporty subjects.

Envy can exert subjects to reduce their opponent's income. Nevertheless previous experiments suggest that envy cannot be held responsible for every hostile decision and every decision to reduce income (Beckman et al., 2002; Bolle and Kemp, 2010; Celse, 2009, 2010). Beckman et al. (2002) convey that envy was responsible for 34% of oppositions to Pareto improvements. Celse (2009, 2010) find that although reduction decisions are mostly undertaken by subjects signalling to be consumed by envy, there were hidden motivations other than envy in subjects' decisions to reduce others' income.²² Bolle and Kemp (2010) do not find any correlation between choices of egalitarian distributions and subjects' envy.²³ In conclusion, we do not conjecture envy to explain most reduction decision. Thus we do not expect to observe that most reduction decisions will be engaged by subjects reporting a decrease in their satisfaction.

4. Results

Now we present the results. We begin with the results concerning individual satisfaction and finish with those relative to individuals' decisions. We always begin with an overall view of the results and then we detail the results.

On aggregate, 31 men and 44 women participated in our experiment. Participants' mean age was 22.45 years old. 48 subjects indicate to practice sport whereas 27 indicate not to practice sport. From now we consider a subject as sporty (or as an athlete) if he indicates to practice sport in a club. Sporty subjects were more productive than non-sporty ones although the difference is not significant ($p = 0.867$, two-tailed Mann-Whitney Test). On average sporty subjects reached 236.14 clicks in 1 minute whereas non-sporty reached 214.70 clicks.

²² Indeed the proportion of subjects reporting a decrease in satisfaction and reducing income is almost similar to the proportion of subjects reporting an increase in satisfaction and reducing income (and also similar to the proportion of subjects reporting no changes in satisfaction and reducing income).

²³ Bolle and Kemp (2010) explore the connection between envy and subjects' preferences for equal distributions. They elicit envy by using the *Dispositional Envy Scale* elaborated by Smith et al. (1999). Then subjects have to vote for distributions of income (unequal and equal ones).

Result 1 : The majority of subjects reports changes in their satisfaction after exposure to upward social comparison. Practicing sport does not affect the probability for a subject’s satisfaction to be affected by social comparisons.

Support: Table 4.2 presents the number (and proportion) of subjects reporting and not reporting a different level of satisfaction after learning the opponent’s endowment than the satisfaction level reported after being informed of their own endowment.

On aggregate (i.e. cumulating data from sporty and non-sporty subjects), 8 subjects out of 10 report a different level of satisfaction after being informed of their opponent’s endowment than the one reported after learning their own endowment. By reporting a different satisfaction level, subjects indicate their satisfaction to be affected by others’ endowments. The proportion of players reporting changes in their satisfaction is significantly higher than the proportion of players not reporting changes ($p < 0.01$, two-sample test of proportions). This result highlights the key role of social comparisons on individual well-being. The latter is largely affected by others’ situations and more precisely by others’ endowment: hypothesis H1a is thus supported.

In Table 4.2, we detail the proportion of subjects reporting and not reporting changes in their satisfaction after exposure to social comparison and whether they declared to practice sport or not. It turns out that, whether subjects practice sport activities or not, the majority of them reports their satisfaction to be affected (whether positively or negatively) by upward social comparisons. Whether subjects practice sport or not, the proportion of subjects reporting changes in their satisfaction after learning their opponent’s endowment is significantly higher than the proportion of subjects not reporting changes in satisfaction ($p < 0.01$ for sporty and non-sporty subjects, two-sample test of proportions). No significant differences have been found when we compare the proportion of subjects reporting changes (resp. no changes) in their satisfaction between sporty and non-sporty subjects (resp. $p > 0.05$ and $p > 0.05$, two-sample test of proportions).

Table 4. 2: Number and proportion (in parentheses) of subjects reporting changes, or not, when evaluating their satisfaction.

	Sporty	Non-sporty	Overall
Players A reporting changes in their satisfaction	40 (83.33%)	20 (74.07%)	60 (80.00%)
Players A not reporting changes in their satisfaction	8 (16.67%)	7 (25.93%)	15 (20.00%)
Total	48 (100.0%)	27 (100.0%)	75 (100.0%)

We aim at identifying whether the practice of sport activities affects the impact of social comparisons on subjects’ well-being. In order to fulfil that objective we estimate a binary logit model and check

whether the variable *Sportpractice* is significantly correlated to the probability for a subject to report changes (whether positive or negative) in his satisfaction after exposure to unflattering social comparisons. The variable *Sportpractice* is dichotomous and catches whether the subject indicates to practice sport in a club or not. If *Sportpractice* equals 0 it means that the subject indicates to practice sport in a club. The variable modelled is " $Eval1 \neq Eval2$ " and equals 1 if the subject reports a different level of satisfaction at the second evaluation than the one reported at the first evaluation. If the dependent variable equals 1 it indicates that the subject declares his satisfaction to be affected (whether positively or negatively) by learning the opponent's endowment. Results from logit estimations are supplied in Table 4.3 and convey that no variable has a significant impact on the probability for a subject's well-being to be affected by others' situation.²⁴ Note that we also run a logit model with the same dependent variable but substituting *Sportpractice* by *Gender* that catches the sex of the subject. *Gender* is also dichotomous and equals 1 when the subject is female. Results from this logit estimation are supplied in Table 4.4. Again no significant variables are correlated to the probability for a subject to indicate changes in his satisfaction after being exposed to social comparison.

Table 4. 3: Results from Logit estimations concerning the probability to report changes in satisfaction after exposure to social comparison (with Sportpractice).

Logit Regression	
Nb.Obs: 75	
Adj-R Squared: 0.0761	
Dependent Variable: Individual well-being is affected by social comparison ($Eval1 \neq Eval2$).	
Independent variables	Coefficients (std. errors)
<i>Clicks</i> (Subject's performance)	0.001 (0.002)
<i>Sportpractice</i> (subject declares to practice sport)	-0.469 (0.626)
D_R (Relative difference)	-0.671 (0.584)
D_A (Absolute difference)	0.145 (0.146)
<i>TpEval1</i> (Time for first evaluation)	-0.017 (0.026)
<i>TpEval2</i> (Time for second evaluation)	-0.005 (0.035)
Constant	2.514 (1.446)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is the subject's well-being is affected by social comparison ($Eval1 \neq Eval2$). The variable *Sportpractice* catches

²⁴ As the variable *Clicks* (i.e. number of clicks made by the subject) and the variable X_A (i.e. the subject's endowment) are highly collinear, it is not possible to introduce both variables in the same logit model. Thus we made a logit model introducing each variable separately and investigate whether each variable has a significant impact on the probability for a subject to report changes in his satisfaction. As both logit models convey the same results we only report results from one logit model. Besides, as logit models prevents the introduction of more than one binary independent variable, it is not possible to introduce the variables *Sportpractice* and *Gender* in the same model. Thus we estimate a binary logit model for each variable separately.

whether the subject indicates to practice sport or no in a club. *Sportpractice* equals 0 if the subject indicates to practice sport activities. The variable *Clicks* refers to the number of *clicks* made by the subject. D_A (resp. D_R) depicts the difference between the subject's endowment and the opponent's one measured in absolute terms (resp. in relative terms). *TpEval1* (resp. *TpEval2*) denotes the time subjects took for first (resp. second) evaluation (measured in seconds). Using subjective data, the typical order of magnitude of the R-Squared is relatively low and ranges from 8% to 20%, so do levels of significance (Senik, 2005).

Table 4. 4: Results from Logit estimations concerning the probability to report changes in satisfaction after exposure to social comparison (with Gender).

Logit Regression	
Nb.Obs: 75	
Adj-R Squared: 0.0843	
Dependent Variable: Individual well-being is affected by social comparison ($Eval1 \neq Eval2$).	
Independent variables	Coefficients (std. errors)
<i>Clicks</i> (Subject's performance)	0.001 (0.002)
<i>Gender</i> (subject's sex)	-0.690 (0.653)
D_R (Relative difference)	-0.691 (0.575)
D_A (Absolute difference)	0.151 (0.143)
<i>TpEval1</i> (Time for first evaluation)	-0.027 (0.026)
<i>TpEval2</i> (Time for second evaluation)	-0.003 (0.035)
Constant	2.971 (1.571)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is the subject's well-being is affected by social comparison ($Eval1 \neq Eval2$). The variable *Gender* catches the subject's sex and equals 1 when the subject is a female. The variable *Clicks* refers to the number of *clicks* made by the subject.

Result 2 : The majority of sporty subjects reports a decrease in their satisfaction after exposure to upward social comparisons. Practicing a sport increases significantly the probability for a subject to report a decrease in his satisfaction after being exposed to unflattering social comparisons.

Support: Table 4.5 details the number and proportion of subjects (in parentheses) reporting positive or negative changes in their satisfaction as well as no changes. Table 4.6 transcribes results from a logit regression made on the probability for a subject to indicate his satisfaction to be negatively affected after exposure to unflattering social comparison.

On aggregate, 54.67% of subjects indicate a decrease in their satisfaction after learning their opponent's endowment whereas 25.33% of subjects report an increase in their satisfaction and 20.00% specify their satisfaction not to be affected by social comparisons (see Table 4.5). The proportion of subjects reporting a decrease in satisfaction after exposure to social comparison is significantly higher than the proportion of subjects reporting an increase or no changes in

satisfaction (resp. $p < 0.01$ and $p < 0.01$, two-sample test of proportions). Results corroborate H1b: exposure to unflattering social comparison affects negatively individual well-being.

Among sporty subjects, we observe that most of them (64.58%) report their satisfaction to be negatively affected by learning their opponent’s endowment. The proportion of sporty subjects reporting a decrease in satisfaction is significantly higher than the proportion of subjects reporting an increase or no changes in satisfaction (resp. $p < 0.01$ and $p < 0.01$, two-sample test of proportions). There is no significant difference between the proportion of sporty subjects reporting an increase in their satisfaction after learning the opponent’s endowment and the proportion of subjects not reporting changes in satisfaction ($p > 0.05$, two-sample test of proportions).

Concerning non-sporty subjects, we do not observe any significant differences when we compare the proportion of subjects whatever the direction of changes in satisfaction ($p > 0.05$ for all comparisons, two-sample test of proportions).

Now we compare the impact of upward social comparisons on satisfaction between sporty and non-sporty subjects. It turns out that there is significantly more sporty subjects reporting a decrease in satisfaction after exposure to social comparison than non-sporty ones ($p < 0.05$, two-sample test of proportions). Concerning the proportion of subjects reporting an increase and no changes in satisfaction, we do not find any significant differences between sporty and non-sporty subjects (resp. $p > 0.05$ and $p > 0.05$, two-sample test of proportions). Hence unflattering social comparisons seem to have a stronger negative impact on the satisfaction of sporty subjects.

Table 4. 5: Number and frequencies of changes (according to direction) and no changes in satisfaction.

Direction of changes	Sporty	Non-Sporty	Overall
Negative changes in satisfaction	31 (64.58%)	10 (37.04%)	41 (54.67%)
No changes in satisfaction	8 (16.67%)	7 (25.92%)	15 (20.00%)
Positive changes in satisfaction	9 (18.75%)	10 (37.04%)	19 (25.33%)
Total	48 (100.0%)	27 (100.0%)	75 (100.0%)

We estimate a binary logit model so as to investigate whether the practice of sport activities strengthens or weakens the negative impact of social comparisons on individual well-being. Table 4.6 provides the results from the logit estimation. The dependent variable modelled is “ $Eval1 > Eval2$ ” and equals 1 when the subject reports a decrease in his satisfaction after learning the opponent’s endowment. With regard to Table 4.6, two variables have a significant impact on the probability for a subject’s well-being to be negatively affected by social comparisons: the subjects’ performance

(captured by the variable *Clicks*) and whether the subject practices sport or no (caught by the variable *Sportpractice*). First, the number of clicks made by the subject (i.e. subject's performance) is significantly and positively correlated to the probability that individual well-being decreases after exposure to social comparison. Indeed the higher the subject's performance the higher the probability for a subject to report a decrease in satisfaction after social comparison. This result suggests that when subjects perform high they expect to perform better than their opponent. It also underlines that envy is more present within high performing subjects rather than in low performing ones. High performing subjects may attach much importance to their relative performance (i.e. how they perform in comparison to others) and envy is ought to be experienced intensively by high performing subjects. Second, the probability for a subject to report a decrease in satisfaction is significantly and negatively correlated to the variable *Sportpractice*. Hence the practice of sport activities increases significantly the likelihood for a subject to report a decrease in satisfaction after exposure to upward social comparison. We substitute *Sportpractice* by *SportTime* in order to see whether subjects practicing sports for a long time are more prone to report a decrease in satisfaction after being exposed to social comparison than subjects practicing sport recently. Whereas the subjects' performance affects significantly and positively the probability to report a decrease in satisfaction, the variable *SportTime* has not a significant correlation. Table 4.7 reports the results from the logit estimation with the introduction of *SportTime*.²⁵ As a subject practicing sport has a larger probability to experience, we validate H1c.

Table 4. 6: Results from Logit estimations concerning the probability to report changes in satisfaction after exposure to social comparison .

Logit Regression	
Nb.Obs: 75	
Adj-R Squared: 0.3116	
Dependent Variable: The subject reports a decrease in satisfaction after social comparison (<i>Eval1</i> > <i>Eval2</i>).	
Independent variables	Coefficients (std. errors)
<i>Clicks</i> (Subject's performance)	0.009 (0.003)***
<i>Sportpractice</i> (subject declares to practice sport)	-1.443 (0.656)**
<i>D_R</i> (Relative difference)	-0.338 (0.491)
<i>D_A</i> (Absolute difference)	0.140 (0.116)
<i>TpEval1</i> (Time for first evaluation)	-0.015 (0.028)
<i>TpEval2</i> (Time for second evaluation)	0.064 (0.039)
Constant	-2.531 (1.636)

²⁵ We also substituted *Sportpractice* by *Gender* in another logit model but *Gender* has no significant impact on the probability for a subject to report a decrease in satisfaction after exposure to social comparisons.

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is the subject's well-being is negatively affected by social comparisons ($Eval1 > Eval2$). The variable *Sportpractice* catches whether the subject indicates to practice sport or no. *Sportpractice* equals 0 if the subject indicates to practice sport activities. The variable *Clicks* refers to the number of clicks made by the subject.

Table 4. 7: Results from Logit estimations concerning the probability to report changes in satisfaction after exposure to social comparison .

Logit Regression	
Nb.Obs: 48	
Adj-R Squared: 0.2513	
Dependent Variable: The subject reports a decrease in satisfaction after social comparison ($Eval1 > Eval2$).	
Independent variables	Coefficients (std. errors)
<i>Clicks</i> (Subject's performance)	0.009 (0.004)**
<i>SportTime</i> (period practicing sport)	0.050 (0.082)
D_R (Relative difference)	-0.129 (0.564)
D_A (Absolute difference)	0.078 (0.130)
<i>TpEval1</i> (Time for first evaluation)	-0.009 (0.040)
<i>TpEval2</i> (Time for second evaluation)	0.094 (0.053)
Constant	-3.920 (2.400)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is the subject's well-being is negatively affected by social comparisons ($Eval1 > Eval2$). The variable *SportTime* catches the time period the subject has been practicing sport. The variable *Clicks* refers to the number of clicks made by the subject.

Result 3 : Sport practice does not affect the determinants of individual well-being. Whether subjects practice sport or not, individual satisfaction is negatively modulated by the subject's endowment, the opponent's one and by the subject's own performance.

Support: Results from PLS regression made on the satisfaction subjects derive from social comparisons are given in Tables 4.8 (for sporty subjects) and 4.9 (for non-sporty subjects).

The question is now the following: what are the determinants of individual satisfaction of sporty subjects and non-sporty ones? To answer to this question, we order *Partial Least Square* regressions (PLS) and explore the determinants of individual well-being for sporty and non-sporty subjects separately.²⁶ To represent individual well-being, we refer to the variable *Diffeval*. *Diffeval* is made by subtracting the two reported levels of satisfaction and catches the impact of social

²⁶ PLS regression is a non-parametric regression method based on the construction of orthogonal factors in order to improve the quality of the model (Tenenhaus, 1998). It suits perfectly for constructing predictive models when the factors are highly collinear and enables regressions without excluding collinear variables. Indeed when factors suffer from collinearity Multiple Linear Regression is inappropriate. Many variables from our experiment suffer from collinearity. Through ordering PLS regressions, we can observe the importance of each variable on predicting the response.

comparisons on individual well-being.²⁷ In other words, *Diffeval* depicts the satisfaction subjects get from social comparisons.

Table 4.8 itemizes the results from a PLS regression made on the well-being of sporty subjects. It turns out that individual well-being is significantly and negatively affected by three variables: the subject's own endowment (X_A), the opponent's endowment (X_B) and the subject's own performance (*Clicks*) that determines the subjects' endowment. Hence as one of these three variables increase, the satisfaction subjects derive from social comparison decreases.

Table 4. 8: Results from PLS regression (variable of importance, weight and direction of the relation) on the satisfaction subjects derive from social comparisons (Sporty subjects).

PLS regression (sporty subjects)				
Nb. Obs : 48				
Adj-R Squared: 0.2827				
Dependent Variable: $Diffeval = (Eval2 - Eval1)$				
Independent variables	Model effect weights (vector Wh*)	Model effect loadings (Vector Ph)	Variable Importance for Projection (VIP)	Unstandardised regression parameters
X_A (Player A's endowment)	-0.576	-0.571	1.421*	-0.199
X_B (Player B's endowment)	-0.483	-0.390	1.229*	-0.225
D_R (Relative difference)	0.313	0.401	0.854	0.054
D_A (Absolute difference)	0.009	0.117	0.389	-0.064
<i>TpEval1</i>	-0.326	-0.234	0.848	-0.166
<i>TpEval2</i>	-0.286	-0.121	0.841	-0.184
<i>Clicks</i>	-0.338	-0.517	1.076*	-0.051
<i>SportTime</i>	0.123	0.089	0.335	0.038
Constant				-0.338

Note: Vectors Wh* (weighting vectors) consist of the weight given to each spectral variable in the computation of the latent variable. Vectors Wh* point out the importance of each explanatory variable in explaining each factor (latent variable). Vectors Ph reflect the correlation between latent variables and explanatory variables: they indicate the direction of the connection. The VIP (Variable Importance for Projection) indicates the importance of each explanatory variable both to explain latent variables and to correlate dependent variable. Important (resp. unimportant) explanatory variables possess VIP values larger (resp. lower) than 1 (resp. 0.5). X_A and X_B depicts respectively the subject's own endowment and the opponent's endowment. D_A (resp. D_R) represents the difference between the subject's endowment and the opponent's one measured in absolute terms (resp. in relative terms). *TpEval1* (resp. *TpEval2*) denotes the time subjects took for the first (resp. second) evaluation (in seconds). The variable *Clicks* catches the number of clicks made by the subject and represents individual effort.

²⁷ *Diffeval = Satisfaction reported at 2nd evaluation – Satisfaction reported at 1st evaluation.*

Table 4.9 presents the results from a PLS regression made on the well-being of non-sporty subjects. We can observe that the same variables have a significant and negative impact on *Diffeval*: the subject’s own endowment (X_A), the subject’s own performance (*Clicks*) and the opponent’s endowment (X_B).

Table 4. 9: Results from PLS regression (variable of importance, weight and direction of the relation) on the satisfaction subjects derive from social comparisons (Non-Sporty subjects).

PLS regression (non-sporty subjects)				
Nb. Obs : 27				
Adj-R Squared: 0.6261				
Dependent Variable: $Diffeval = (Eval2 - Eval1)$				
Independent variables	Model effect weights (vector Wh*)	Model effect loadings (Vector Ph)	Variable Importance for Projection (VIP)	Unstandardised regression parameters
X_A (Player A’s endowment)	-0.481	-0.545	1.274*	-0.243
X_B (Player B’s endowment)	-0.612	-0.551	1.619*	0.309
D_R (Relative difference)	0.147	0.232	0.390	0.074
D_A (Absolute difference)	-0.228	-0.087	0.603	-0.115
<i>TpEval1</i>	-0.00009	-0.092	0.0002	-0.00009
<i>TpEval2</i>	-0.251	-0.208	0.663	-0.127
<i>Clicks</i>	-0.506	-0.533	1.339*	-0.256
Constant				-0.157

With regard to results from PLS regressions, we can observe that whether subjects declare to practice sport or no, the determinants of individual well-being are identical. Players’ endowments and subjects’ performance modulate negatively individual satisfaction. In line with Layard (2005) and Celse (2009, 2010) we observe that individual income has a significantly negative effect on the satisfaction subjects derive from upward social comparison. This suggests that above a certain level of income, subjects put a larger weight on others’ situations and allow more importance to others’ income rather than to their own income.

Result 4 : The majority of reduction decisions is engaged by sporty subjects.

Support: Table 4.10 reports the number and proportion (in parentheses) of reduction decisions engaged by sporty and non-sporty subjects. Table 4.11 details the proportion of subjects choosing to reduce the opponent’s endowment within sporty and non-sporty subjects. We use the term “intensity” when we refer to the amount subjects invest in reduction decisions.

On aggregate, 29 subjects out of 75 indicate to be willing to reduce their opponent’s endowment. Thus, on aggregate, 38.66% of subjects choose to engage in destructive actions (see Table 4.11). This result highlights the key role of social comparisons on individual behaviour: social comparisons exert more than one third of subjects to reduce others’ income.

Now we take a look at the reduction decisions engaged (Table 4.10). On the one hand, 22 out of the 29 reductions decisions engaged result from sporty subjects’ decisions. On the other hand, only 7 reductions decisions out of 29 are undertaken by non-sporty subjects. Hence, sporty subjects’ reduction decisions represent 75.86% of the total number of reduction decisions whereas non-sporty subjects’ reduction decisions represent only 24.14% of the total number of negative decisions. The proportion of reduction decisions engaged by sporty subjects (75.86%) is significantly higher than the proportion of reduction decisions engaged by non-sporty subjects (24.14%) ($p < 0.01$, two-sample test of proportions).

Table 4. 10: Number (and proportion) and intensity of reduction decisions engaged.

	Sporty	Non-sporty	Overall
Reduction decisions	22 (75.86%)	7 (24.14%)	29 (100.0%)
Average amount invested	6.32	6.71	6.41

Nevertheless if we compare the ratio between the number of sporty subjects choosing to reduce endowments and the total number of sporty subjects (i.e. 45.83%) with the ratio between the number of non-sporty subjects choosing to reduce endowments and the total number of non-sporty subjects (i.e. 25.93%), we do not observe any significant differences. Although the proportion of sporty subjects choosing to reduce is higher than the proportion of non-sporty subjects choosing to reduce, the difference is not statistically significant at 0.05 level of significance but significant at 0.1 level of significance ($p = 0.08$, two-sample test of proportions). Table 4.11 depicts the proportion of subjects choosing to reduce income according whether subjects practice sport or not. Hence although the majority of destructive decisions results from decisions of sporty subjects, we observe almost a similar proportion of sporty and non-sporty subjects that choose to reduce their opponent’s endowment.

Table 4. 11: Proportion of sporty (and non-sporty) subjects reducing income.

	Sporty	Non-sporty	Overall
Number of reduction decisions (①)	22	7	29
Number of subjects (②)	48	27	75
Proportion of reduction decisions (①/②)	45.83%	25.93%	38.66%

Now we compare the amount invested in reduction decisions by sporty subjects and non-sporty subjects. Both sporty and non-sporty subjects invest an important amount in reduction decisions. On average sporty subjects invest 6.32 units when reducing income whereas non-sporty subjects invest 6.71 units. Results from a Kolmogorov-Smirnov test for equality of distribution convey that the distribution of decisions' intensity are not different between sporty and non-sporty subjects ($p > 0.05$, Kolmogorov-Smirnov test for equality of distribution). The average intensity of reduction decisions from sporty subjects is not significantly different than the average intensity of reduction decisions from non-sporty subjects ($p > 0.05$, two-tailed Mann-Whitney Test). Reductions decisions are not more intense whether subjects practice sport or not.

We ordered PLS regressions so as to investigate the determinants of the amount invested in reduction decisions. We made PLS regressions for sporty and non-sporty subjects separately. Table 4.12 and Table 4.13 report the results from PLS regression respectively made on sporty subjects and non-sporty subjects.

Concerning sporty subjects, results suggest that satisfaction measures are correlated to athletes' behaviour. Besides the satisfaction subjects derive from social comparisons (*Diffeval*) and the relative difference (D_R) are positively correlated to the intensity of reduction decisions. Hence the more satisfaction an athlete derives from unflattering social comparisons, the higher portion of his opponent's endowment he cuts.²⁸ Concerning D_R , the higher the relative difference, the more athletes invest in reduction decisions. This result, at first sight puzzling, is often observed in sport. For example, in football, when there is large difference between the levels of two teams, the team with the inferior level always behave aggressively against the other team so as to intimidate the latter. Beck (1999) states that hostility is a common and natural answer when someone is in a situation of inferiority. Finally, the negative correlation between the time athletes take for evaluating their satisfaction (*TpEval1* and *TpEval2*) and the intensity of reduction decision can signal the experience of negative emotions (see the Discussion section).

²⁸ We compare the intensity of reduction decisions engaged by athletes whose satisfaction decreases after being exposed to social comparison with the intensity of reduction decisions engaged by athletes whose satisfaction increases. The difference is not significant ($p = 0.117$, two-tailed Mann-Whitney Test).

Table 4. 12: Results from PLS regression made on the amount subjects invest in reduction decisions (Sporty subjects).

PLS regression (sporty subjects)				
Nb. Obs : 48				
Adj-R Squared: 0.4434				
Dependent Variable: Intensity of reduction decisions ($e, e \in [1; 10]$)				
Independent variables	Model effect weights (vector Wh*)	Model effect loadings (Vector Ph)	Variable Importance for Projection (VIP)	Unstandardised regression parameters
X_A (Player A's endowment)	-0.256	-0.422	0.809	-0.114
X_B (Player B's endowment)	0.019	-0.066	0.060	0.008
D_R (Relative difference)	0.362	0.438	1.147	0.162
D_A (Absolute difference)	0.266	0.316	0.849	0.119
$TpEval1$	-0.474	-0.374	1.501	-0.212
$TpEval2$	-0.350	-0.361	1.107	-0.156
$Clicks$	0.028	-0.275	0.088	-0.012
$Diffeval$	0.572	0.412	1.809	0.255
$Diffevalabs$	-0.036	-0.015	0.114	-0.016
$SportTime$	0.231	0.086	0.733	0.103
Constant				1.740

Concerning non-sporty subjects, we observe again the same negative correlation between the time needed for evaluating satisfaction ($TpEval1$) and the intensity of reduction decisions. The variable $Clicks$ is also negatively correlated to the intensity of destructive decisions. This means that the lower the individual performance and the higher the intensity of reduction decisions. This corroborates the explanation given above concerning sporty subjects: low levels athletes behave aggressively against high level athletes. Finally we also observe that the subject's endowment (X_A) is significantly and negatively correlated to the amount invested in reducing income. As endowments increase subjects invest less in reduction decisions. A plausible explanation would be that, for non-athletes, the psychological cost for reducing income is low when endowments are low but it increases with endowments. Although reducing income has the same relative weight on player A's endowment, subjects might consider that sacrificing 2.5% of his endowment by unit of reduction to decrease his opponent's income is not so important when endowments are low. Conversely such sacrifice is important when endowments are high. Then determinants of the intensity of reduction decisions are different between athletes and non-athletes. Non-athletes tend to focus more on their

situation and of the opponent's one whereas athletes care more about the gap between subjects' situations and about how they experience these inequalities.

Table 4. 13: Results from PLS regression made on the amount subjects invest in reduction decisions (Non-sporty subjects).

PLS regression (non-sporty subjects)				
Nb. Obs : 27				
Adj-R Squared: 0.6970				
Dependent Variable: Intensity of reduction decisions ($e, e \in [1; 10]$)				
Independent variables	Model effect weights (vector Wh*)	Model effect loadings (Vector Ph)	Variable Importance for Projection (VIP)	Unstandardised regression parameters
X_A (Player A's endowment)	-0.515	-0.532	1.545	-0.251
X_B (Player B's endowment)	-0.370	-0.402	1.112	-0.181
D_R (Relative difference)	0.211	0.333	0.634	0.103
D_A (Absolute difference)	0.108	0.241	0.326	0.053
$TpEval1$	-0.376	-0.412	1.129	-0.184
$TpEval2$	0.249	0.050	0.748	0.249
$Clicks$	-0.508	-0.457	1.528	-0.248
$Diffeval$	-0.196	-0.216	0.590	-0.096
$Diffevalabs$	-0.197	-0.216	0.590	-0.096
Constant				1.945

Result 5 : Whether subjects practice sport or not, the majority of reduction decisions is engaged by subjects reporting changes in their satisfaction after being exposed to unflattering social comparisons.

Support: The number of reduction decisions engaged by subjects reporting or not reporting changes in their satisfaction is supplied in Table 4.14. Table 4.16 transcribes the number of reduction decisions according to direction of changes in satisfaction.

On aggregate, almost 8 reduction decisions out of 10 result from choices of subjects that report their satisfaction to be affected (whether positively or negatively) by learning the opponent's endowment. The proportion of reduction decisions engaged by subjects whose satisfaction changes after learning the opponent's endowment is significantly higher than the proportion of reduction decisions engaged by subjects whose satisfaction remains identical after exposure to social comparison ($p < 0.01$, two-sample test of proportions).

We do observe the same result among sporty subjects and non-sporty ones (see Table 4.14). The proportion of reduction decisions engaged by sporty subjects indicating their satisfaction to be affected by social comparisons is significantly higher than the proportion of reduction decisions engaged by sporty subjects indicating their satisfaction not to be affected by social comparisons ($p < 0.01$, two-sample test of proportions). Although the proportion of reduction decisions resulting from non-sporty subjects that indicate changes in their satisfaction after exposure to social comparison is higher than the proportion of destructive decisions resulting from non-sporty subjects indicating no changes in satisfaction, the difference is not statistically significant ($p > 0.05$, two-sample test of proportions). This might be partly due to the poor number of non-sporty subjects (27 subjects). Besides the proportion of subjects reducing their opponent's endowment and whose satisfaction changes after exposure to unflattering social comparison is not significantly different between sporty and non-sporty subjects ($p > 0.05$, two-sample test of proportions).

Table 4. 14: Number and proportion (in parentheses) of subjects choosing to reduce their opponent's endowment according to satisfaction.

	Sporty	Non-sporty	Overall
Subjects reporting changes in their satisfaction	18 (81.82%)	5 (71.43%)	23 (79.31%)
Subjects not reporting changes in their satisfaction	4 (18.18%)	2 (28.57%)	6 (20.69%)
Total	22 (100.0%)	7 (100.0%)	29 (100.0%)

Although most reduction decisions result from subjects whose satisfaction is affected by social comparisons, satisfaction includes some limits when predicting individual behaviour. Indeed, 40 sporty subjects out of 48 indicate their satisfaction to be affected (whether positively or negatively) by social comparisons. If we take a look at these 40 subjects, we can observe that 18 of them (i.e. 45.00%) choose to reduce their opponent's endowment. On the other hand, 8 sporty subjects out of 48 do not indicate changes in their satisfaction after learning their opponent's endowment. Among these 8 indifferent sporty subjects, 4 choose (i.e. 50.00%) to destroy their opponent's endowment. So we observe almost the same proportion of subjects choosing to reduce income whatever the satisfaction they reported.²⁹ The difference between these two proportions is not significantly different ($p > 0.05$, two-sample test of proportions). This observation holds also for non-sporty subjects. Table 4.15 illustrates our point. Thus H2a finds partial support: albeit most reduction decisions are engaged by subjects experiencing social emotions, the latter cannot be held responsible for leading to destroy the opponent's endowment.

²⁹ See Celse (2009, 2010).

Table 4. 15: Proportion of sporty (and non-sporty) subjects reducing income and according to direction of changes in satisfaction.

	Sporty	Non-sporty	Overall
Number of subjects reporting changes in satisfaction (①)	40	20	60
Number of reduction decisions resulting from subjects reporting changes in their satisfaction (②)	18	5	23
Proportion of reduction decisions engaged by subjects reporting changes in their satisfaction (②/①)	45.00%	25.00%	38.33%
Total number of subjects not reporting changes in satisfaction (③)	8	7	15
Number of reduction decisions resulting from subjects not reporting changes in their satisfaction (④)	4	2	6
Proportion of reduction decisions engaged by subjects not reporting changes in their satisfaction (④/③)	50.00%	28.57%	40.00%

Now we detail who choose to reduce their opponent’s endowment. Table 4.16 details the reduction decisions engaged according to the direction of changes in satisfaction. On aggregate, when we compare the number and proportions of subjects choosing to reduce income according to the direction of changes in satisfaction, we do not observe any significant differences ($p > 0.05$ for all comparisons, two-sample test of proportions). Subjects reporting a decrease in satisfaction after learning the opponent’s endowment engage in as many destructive decisions than subjects reporting an increase in satisfaction. Reporting a decrease in satisfaction indicates that a subject exhibits envy. Thus, on aggregate envy is responsible for more than a third of reduction decisions and results suggest the existence of other motivations behind subjects’ choices (see the Discussion section).

If we look at the reduction decisions engaged by sporty subjects, we can observe that the majority of negative actions is engaged by subjects reporting a decrease in satisfaction (12 actions out of 22 i.e. 54.55%). Although the number of reduction decisions engaged by subjects reporting a decrease in satisfaction is twice the number of reduction decisions undertaken by subjects reporting an increase in satisfaction, the difference is not significant ($p > 0.05$, two-sample test of proportions). Nevertheless the number of reduction decisions resulting from subjects whose satisfaction decreases after exposure to social comparison is significantly higher than the number of reduction decisions undertaken by subjects not reporting changes in their satisfaction ($p < 0.05$, two-sample test of proportions). The proportion of reduction decisions is not significantly different between subjects

reporting an increase in satisfaction and subjects not reporting changes in satisfaction ($p > 0.05$, two-sample test of proportions).

Concerning reduction decisions engaged by non-sporty subjects, a striking result is that no subjects reporting a decrease in satisfaction choose to reduce the opponent's endowment. Conversely reductions decisions are mostly undertaken by subjects whose satisfaction increases after social comparison. The proportion of negative actions engaged by subjects reporting an increase in their satisfaction is not significantly different to the proportion of negative actions engaged by subjects reporting no changes in their satisfaction after exposure to social comparison ($p > 0.05$, two-sample test of proportions). The main difference between sporty and non-sporty subjects relies on subjects reporting a decrease in their satisfaction. Although subjects reporting negative changes in their satisfaction engage the majority of reduction decisions among sporty subjects, we do not observe such a result among non-sporty subjects. The proportion of subjects that indicate a decrease in satisfaction after social comparison and choosing to reduce income is significantly different between sporty and non-sporty subjects ($p < 0.05$, two-sample test of proportions). Whereas there are no significant differences if we compare the proportion of reduction decisions undertaken by subjects reporting no changes in satisfaction between sporty and non-sporty subjects ($p > 0.05$, two-sample test of proportions), the proportion of destructive decisions engaged by subjects reporting an increase in their satisfaction is significantly different between sporty and non-sporty subjects ($p < 0.05$, two-sample test of proportions). Hence social comparisons affect largely the behaviour of sporty individuals: most reduction decisions result from subjects reporting their satisfaction to be affected whether positively or negatively by unflattering social comparisons.

Table 4. 16: Number and proportions (in parentheses) of reduction decisions undertaken according to direction of changes in satisfaction.

	Sporty	Non-Sporty	Overall
Subjects reporting negative changes in their satisfaction	12 (54.55%)	0 (0.0%)	12 (41.38%)
Subjects not reporting changes in their satisfaction	4 (18.18%)	2 (28.57%)	6 (20.69%)
Subjects reporting positive changes in their satisfaction	6 (27.27%)	5 (71.43%)	11 (37.93%)
Total number of reduction decisions	22 (100.0%)	7 (100.0%)	29 (100.0%)

Result 6 : Practicing a sport activity affects significantly and positively the probability for a subject to reduce his opponent’s endowment.

Support: Results from a binary logit model relative to the probability for a subject to engage in a reduction decision are reported in Table 4.17.

In order to conclude our research, we aim at investigating whether the practice of sport modulates individuals’ behaviour. Thus in order to identify whether sport affects significantly subjects’ decisions to reduce others’ endowments, we implement a binary logit model. The dependent variable is *Action* and equals 1 when the subject chooses to reduce his opponent’s endowment. With regard to Table 4.17, it turns out that only two variables are significantly correlated to the probability of reducing income: the subject’s own performance (*Clicks*) and sport practice (*Sportpractice*). Both variables are negatively correlated to the probability of reducing.³⁰

Table 4. 17: Results on Logit regression concerning the probability to reduce the opponent’s endowment (overall).

Logit Regression (all data)	
Nb. Obs: 75	
Adj-R Squared: 0.2006	
Dependent Variable: Subject reduces the opponent’s endowment (<i>Action</i> = 1)	
Independent variables	Coefficients (std. errors)
<i>Diffeval</i> (= $Eval2 - Eval1$)	0.008 (0.014)
<i>Diffevalabs</i> (= $ Eval2 - Eval1 $)	0.025 (0.017)
D_R (Relative difference)	-0.090 (0.098)
D_A (Absolute difference)	0.300 (0.429)
<i>TpEval1</i> (Time for first evaluation)	0.015 (0.025)
<i>TpEval2</i> (Time for second evaluation)	-0.008 (0.034)
<i>Clicks</i> (subject performance)	-0.005 (0.002)*
<i>Sportpractice</i> (subject practices sport)	-1.394 (0.647)**
Constant	0.437 (1.406)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is subject chooses to reduce the opponent’s endowment. The dependent variable is *Action*, it equals 1 when the subject chooses to reduce the opponent’s endowment. *TpEval1* (resp. *TpEval2*) denotes the time the subject took for the first (resp. second) evaluation of satisfaction. D_A (resp. D_R) represents the difference between the subject’s endowment and the opponent’s one measured in absolute terms (resp. in relative terms). *Diffeval* measures the impact of social comparisons on subjects’ satisfaction and corresponds to the difference between the satisfaction level reported at the second evaluation with the

³⁰ We also estimate a logit model substituting *Clicks* by the subject’s endowment (X_A) and results are identical.

satisfaction level reported at the first evaluation. *Diffevalabs* denotes the intensity of changes in satisfaction and corresponds to the absolute value of *Diffeval* ($Diffevalabs = |Diffeval|$).

Hence as subjects' number of clicks increase, the probability for the subject to engage in reduction decision decreases. Indeed subjects whose performance is poor are more prone to engage in destructive decisions than subjects whose performance is high. This result might again suggest the existence of additional motivations other than envy behind subjects' decisions (see the Discussion section).

Furthermore a subject indicating to practice a sport in a club is more prone to reduce his opponent's endowment than a subject indicating not to practice sport. This result conveys that sporty people are more likely to reduce others' income than non-sporty ones. Besides, among sporty subjects, reduction decisions are in majority the result from choices of subjects reporting their satisfaction to be negatively affected by others' higher endowments. These two cumulated results point out the pervasiveness of envy in competitive settings and more precisely in sport environments. Our main assumption relative to the correlation between destruction and sport (H2b) is finally validated.

We explore the determinants of individual behaviour among sporty subjects. To fulfil that perspective we estimate a binary logit model in which the dependent variable remains the same as above (*Action*) but we restrict our analysis to sporty subjects ($n = 48$). We also introduce the variables *SportTime* and *Sportcompetition*. *Sportcompetition* captures whether the subject indicates to participate in competitions. *Sportcompetition* is dichotomous and equals 1 when the subject answers no. Table 4.18 summarizes the results from the logit model. We observe that the probability for an athlete to reduce income is significantly and positively correlated to the intensity of changes in satisfaction (*Diffevalabs*), to the time taken for the first evaluation (*TpEval1*), to the time spent in practicing sport (*SportTime*) and negatively to the subject's performance (*Clicks*). Hence a subject that has been practicing sport for six years is more prone to reduce his opponent's endowment than a subject that has been practicing for two years. Again this result highlights the pervasiveness of envy in sport. Besides subjects reporting high changes in satisfaction are more prone to reduce their opponent's endowment than subjects reporting slight changes in satisfaction. This might suggest that sporty people who react intensively to their changes in their environment are more likely to engage in action. This result is in line with those from Bardel et al. (2010) and Wilson and Kerr (1999). Athletes react intensively to changes, even slight, of their immediate environment by engaging in behaviour. What seems more surprising is the positive correlation between the time taken for the first evaluation and the decision to reduce. This suggest the implication of disappointment in decisions to reduce. When asked to report their satisfaction relative to their

endowment, sporty subjects might take more time because they analyse their performance and the causes of their disappointment (see next section).

Table 4. 18: Results on Logit regression concerning the probability to reduce the opponent’s endowment (sporty subjects).

Logit Regression (sporty subjects)	
Nb. Obs: 48	
Adj-R Squared: 0.3854	
Dependent Variable: Subject reduces the opponent’s endowment (<i>Action</i> = 1)	
Independent variables	Coefficients (std. errors)
<i>Diffeval</i> (= <i>Eval2</i> – <i>Eval1</i>)	0.048 (0.054)
<i>Diffevalabs</i> (= <i>Eval2</i> – <i>Eval1</i>)	0.096 (0.059)*
<i>D_R</i> (Relative difference)	0.357 (0.623)
<i>D_A</i> (Absolute difference)	-0.085 (0.132)
<i>TpEval1</i> (Time for first evaluation)	0.088 (0.050)*
<i>TpEval2</i> (Time for second evaluation)	-0.0037 (0.049)
<i>Clicks</i> (subject performance)	-0.007 (0.004)*
<i>SportTime</i> (Time practicing sport)	0.238 (0.111)**
<i>Sportcompetition</i> (Participation to competitions)	1.026 (1.078)
Constant	-4.511 (2.954)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is subject chooses to reduce the opponent’s endowment. The dependent variable is *Action*, it equals 1 when the subject chooses to reduce the opponent’s endowment.

Again we investigate whether there exists a gender difference on individual behaviour and estimate a logit model substituting *Sportcompetition* by *Gender*. *Gender* has no significant effect on the probability to engage in reduction decisions. We also investigate whether the sport type (collective or individual) affects the probability to reduce others’ endowments and the estimated logit model conveys no significant results. Hence whether subjects practice individual sports (e.g. tennis, swimming) or collective ones (e.g. football, basketball) does not exert them to engage in destructive actions. Finally we estimate a logit model substituting *Sportcompetition* by the variable *Rival*. Some sports involve a dyadic relation (the subject against a rival that can be constituted by a person or a group of persons) whereas other are more oriented toward oneself. Indeed some sports pushes the athlete to outperform a rival (e.g. swimming, martial arts, football, tennis...) whereas others exerts the rival to surpass oneself and overcome his own limits and performance (e.g. hiking, fitness, aerobic, dance...). In other words, there are sports in which one compete with others and sports in which one compete with oneself. To catch that distinction, we build a variable entitled *Rival*. That

variable is dichotomous and equals 1 when the sport practiced involves a rival the subject has to overpass. 36 out of 48 sporty subjects indicate to practice a sport with a well defined rival. Table 4.19 reports the results from logit regressions and conveys that *Rival* is negatively and significantly correlated to the probability for the subject to undertake a reduction decision. Then subjects practicing sports that are more self-oriented (i.e. exerting the subject to surpass his own performances) are more prone to reduce others' income than other sporty subjects. One plausible explanation is that subjects practicing self-oriented sports are not used to compare their performances with others, to compete with others and, as a consequence, they do not appreciate unflattering social comparisons. Hence these athletes are tempted to react in a hostile way when they confront their performances with better performing individuals.

Table 4. 19: Results from logit estimations concerning the probability to reduce the opponent's income (with variable *Rival*).

Logit Regression (sporty subjects)	
Nb. Obs: 48	
Adj-R Squared: 0.4639	
Dependent Variable: Subject reduces the opponent's endowment (<i>Action</i> = 1)	
Independent variables	Coefficients (std. errors)
<i>Diffeval</i> (= <i>Eval2</i> – <i>Eval1</i>)	0.051 (0.048)
<i>Diffevalabs</i> (= <i>Eval2</i> – <i>Eval1</i>)	0.093 (0.052)*
<i>D_R</i> (Relative difference)	0.102 (0.609)
<i>D_A</i> (Absolute difference)	-0.046 (0.123)
<i>TpEval1</i> (Time for first evaluation)	0.121 (0.053)**
<i>TpEval2</i> (Time for second evaluation)	-0.032 (0.048)
<i>Clicks</i> (subject performance)	-0.010 (0.004)**
<i>SportTime</i> (Time practicing sport)	0.286 (0.124)**
<i>Rival</i>	-3.009 (1.391)**
Constant	-1.692 (2.811)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is subject chooses to reduce the opponent's endowment. The dependent variable is *Action*, it equals 1 when the subject chooses to reduce the opponent's endowment. *Rival* catches whether the sport indicated by the subject involves competition with rival (*Rival* = 1) rather than self-oriented competition (*Rival* = 0).

We then examine the behaviour from non-sporty subjects and again estimate a logit model modelling the probability for a non-sporty subject to reduce the opponent's endowment. Results from the logit estimation are given in Table 4.20. It turns out that no variable has a significant impact

on individual behaviour. Among non-sporty subjects, decisions to reduce others' income seem to be depend on factors that are beyond our control.

Table 4. 20: Results from logit estimation concerning the probability for a subject to reduce the opponent's endowment (non-sporty subjects).

Logit Regression (non-sporty subjects)	
Nb. Obs: 27	
Adj-R Squared: 0.4426	
Dependent Variable: Subject reduces the opponent's endowment (<i>Action</i> = 1)	
Independent variables	Coefficients (std. errors)
<i>Diffeval</i> (= <i>Eval2</i> – <i>Eval1</i>)	0.463 (3.949)
<i>Diffevalabs</i> (= <i>Eval2</i> – <i>Eval1</i>)	-0.559 (3.949)
<i>D_R</i> (Relative difference)	-2.733 (7.887)
<i>D_A</i> (Absolute difference)	0.588 (2.102)
<i>TpEval1</i> (Time for first evaluation)	-0.084 (0.090)
<i>TpEval2</i> (Time for second evaluation)	-0.154 (0.010)
<i>Clicks</i> (subject performance)	-0.011 (0.019)
<i>Gender</i>	-1.128 (1.321)
Constant	11.955 (11.175)

Note: * indicates significant at 0.1 level; ** significant at 0.05 level and *** significant at 0.01 level. The probability modelled is subject chooses to reduce the opponent's endowment. The dependent variable is *Action*, it equals 1 when the subject chooses to reduce the opponent's endowment. The variable *Gender* catches the sex of the subject and equals 1 when the subject is a female. *Clicks* refers to the number of clicks made by the subject.

5. Discussion

We now discuss striking results. Within sporty subjects we observe that 6 actions out of 22 (i.e. 27.27%) are engaged by subjects reporting an increase in their satisfaction after learning their opponent's endowment. Besides we also observe that the more satisfaction an athlete derives from unflattering social comparisons and the higher portion of his opponent's endowment he cuts. Although a subject indicating his satisfaction to be negatively affected by social comparisons is said to experience envy, a subject whose satisfaction is positively affected by social comparison is said to experience positive social emotions like altruism or generosity. These positive emotions are not ought to exert subjects to reduce others' income. Then there are hidden motivations behind subjects' decisions to reduce. In our experiment subjects might signal to be happy for others' higher situation

(and thus report positive changes in satisfaction after exposure to upward social comparison) but may be distressed by their own performance or disappointed of having failed to obtain a better endowment. Then pushed by their disappointment, they engage in reduction decisions. This corroborates our hypothesis. Hence subjects indicating an increase in their satisfaction after learning their opponent’s endowment are likely to be consumed with disappointment.³¹ Disappointment is defined as “*the displeasure about the nonoccurrence of a desirable outcome*” and arises when the subject fails in achieving his objectives. Disappointment is closely related to decision making (Loomes and Sugden, 1982, 1986; Zeelenberg, 1999; Zeelenberg et al., 2000). Gill and Prowse (2009) observed that disappointment deterred second movers to exert efforts so as to win the competition. Celse (2010) find that disappointment could be held responsible for leading to engage in reduction decisions. Disappointment can be captured by referring to the satisfaction level given at the first evaluation. If the satisfaction level reported at the first evaluation is negative the subject indicates to be disappointed of his endowment or performance. Then if disappointment is involved in reduction decisions, we may observe that most reduction decisions engaged by subjects reporting an increase after exposure to social comparison are undertaken by disappointed subjects, i.e. subjects indicating a negative satisfaction level at the first evaluation. We use the term “*disappointed*” subject to represent a subject indicating a negative level of satisfaction at the first evaluation.

Table 4.21 presents the number and proportion of reduction decisions engaged by subjects reporting an increase in their satisfaction after exposure to upward social comparison according to the satisfaction level they report at the first evaluation of satisfaction. From Table 4.21 we can observe that 8 subjects out of 9 report a negative satisfaction level at the first evaluation indicating their disappointment. Besides all reduction decisions are engaged by disappointed subjects. Hence we find evidences suggesting that disappointment is responsible for leading subjects whose satisfaction increases after exposure to social comparison to reduce their opponent’s endowment.

Table 4. 21: Number of subjects and reduction decisions undertaken by subjects whose satisfaction increases after exposure to social comparison according to the value given at the first evaluation of satisfaction.

	Nb. Obs. (proportion)	Nb. of reduction decisions	Proportion of reduction decisions
<i>Eval1</i> > 0	1 (11.11%)	0	0.0%
<i>Eval1</i> = 0	0 (0.0%)	0	0.0%
<i>Eval1</i> < 0	8 (88.89%)	6	100%

Note: *Eval1* refers to the satisfaction level reported at the first evaluation. *Eval1* < 0 means that the satisfaction level reported by the subject at the first evaluation is negative.

³¹ The average effort (i.e. number of clicks made) by subjects whose satisfaction decreases (resp. increases) after exposure to social comparison is 287.74 clicks (resp. 153.55 clicks).

We examine further by looking at the reduction decisions engaged by subjects whose satisfaction decreases after exposure to social comparison according to the satisfaction level they indicate at the first evaluation (see Table 4.22). To corroborate our hypothesis, one should not observe among subjects experiencing envy (i.e. reporting a decrease in satisfaction) that most reduction decisions arise from disappointed subjects. From Table 4.22, we observe that among the 12 subjects choosing to reduce income, only 4 indicate a negative satisfaction level at the first evaluation of satisfaction. Then disappointment is not responsible for leading to destruction among subjects whose satisfaction decreases after exposure to social comparison.

Table 4. 22: Number of subjects and reduction decisions undertaken by subjects whose satisfaction decreases after exposure to social comparison according to the value given at the first evaluation of satisfaction.

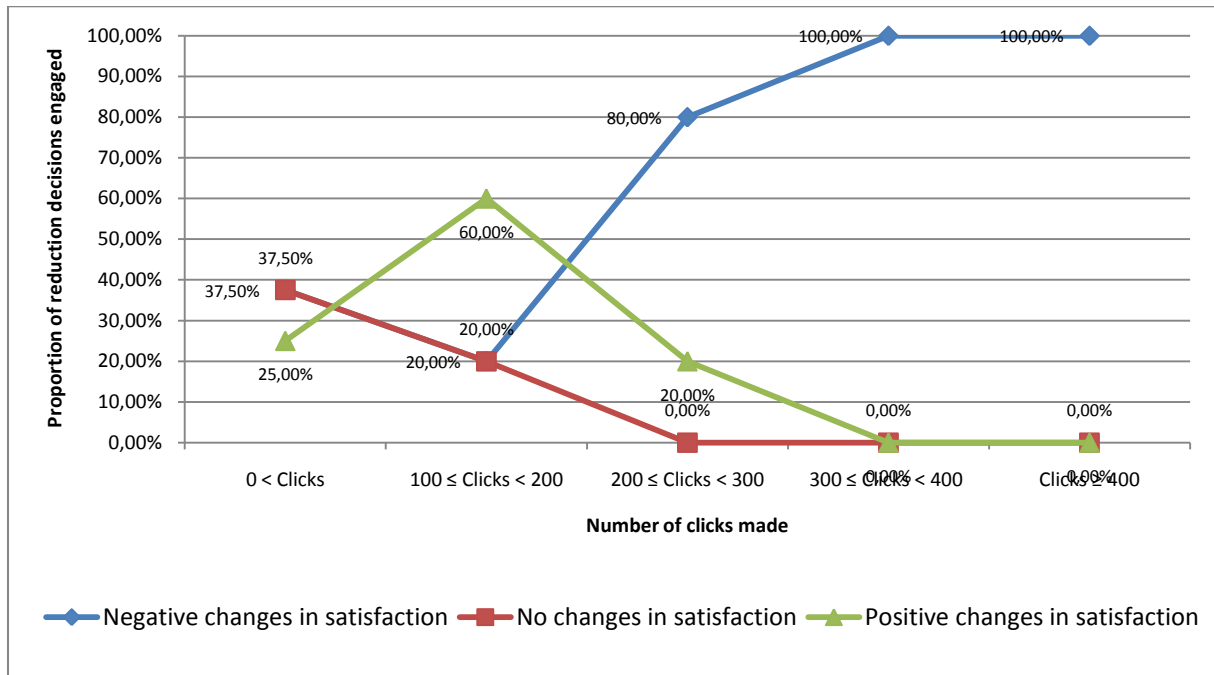
	Nb. Obs. (proportion)	Nb. of reduction decisions	Proportion of reduction decisions
<i>Eval1</i> > 0	22 (70.97%)	8	66.67%
<i>Eval1</i> = 0	0 (0.0%)	0	0.0%
<i>Eval1</i> < 0	9 (29.03%)	4	33.33%

Finally, if disappointment is involved in reduction decisions from subjects deriving satisfaction from unflattering social comparisons then we should observe that most reduction decisions engaged by low performing subjects result from subjects whose satisfaction increases after social comparison. First, We find that subjects reporting their satisfaction to be negatively affected by social comparison perform significantly more than subjects reporting positive changes in their satisfaction ($p < 0.05$, two tailed Mann-Whitney test).³² Then we explore who choose to reduce income according to the direction of changes in satisfaction and to individual effort. Figure 1 pictures the proportion of reduction decisions according to the direction of changes in satisfaction and to the effort concerning sporty subjects. From Figure 4.1, it turns out that concerning high performing athletes (i.e. reaching more than 300 clicks) all reduction decisions are engaged by subjects indicating to experience envy. Among low performing athletes, most reduction decisions are engaged by subjects reporting positive changes. Then results from Figure 4.1 underscores the role of disappointment in reduction decisions from subjects deriving satisfaction from social comparisons. It also highlights the role of envy in reduction decisions from high performing subjects.³³

³² Definition quoted from van Dijk et al. (1999, p 205).

³³ Envy is acknowledged to be experienced more intensively in highly competitive settings.

Figure 4. 1 Proportion of reduction decisions engaged by athletes according to the direction of changes in satisfaction and to individual effort.



In our experiment we measure the time subjects took for evaluating their satisfaction. It turns out that this measure is significantly correlated to individuals' decisions. We observe that, whether subjects practice sport or not, they cut a higher fraction of their opponent's endowment when they take little time to evaluate their satisfaction (see result 4). Negative emotions (e.g. anger, envy) are known for arising quickly and for having a strong impact on individual behaviour (Ben Ze'ev, 2000; Lazarus, 1991; Ortony et al., 1988). A subject consumed by negative emotions takes little time to evaluate his satisfaction and, under the influence of such emotions, he is exerted to cut a high portion of his opponent's endowment.

6. Conclusion

Are athletes more prone to react negatively both from an affective and a behavioural perspective when they face unflattering social comparisons? Will John the student or Jack the athlete be more distressed and prompt to reduce others' situations and income? We implement an experimental protocol so as to explore the dark side of sport, i.e. to investigate the connection between sport practice and antisocial behaviour. We find empirical evidences suggesting that Jack the athlete is more often pained when exposed to unflattering social comparisons and more likely to engage in hostile behaviour.

Thanks to our experimental design we catch the impact of unfavourable social comparisons on both individuals' satisfaction and decisions to reduce others' income. We find affective and behavioural differences between sporty and non-sporty subjects. We observe that social comparisons influence significantly individual well-being: the great majority of subjects reports changes in satisfaction after exposure to social comparisons. This result remains robust whether subjects are athletes or not. More precisely, unflattering social comparisons generates a significant decrease in athletes' well-being and not on non-sporty subjects' well-being. Besides sport practice is negatively correlated to the satisfaction derived from social comparisons. Indeed practicing a sport increases the probability for a subject to report a decrease in satisfaction after exposure to disadvantageous social comparisons. Concerning reduction decisions, the majority of them is engaged by subjects (whether sporty or non-sporty ones) whose satisfaction is affected by social comparisons. Then most reduction decisions result from decisions of athletes rather than non-athletes. Finally sport practice modulates individuals' decisions to reduce others' income: athletes are more to engage in reducing income than non-athletes. When exploring deeper athletes' decisions, we find that the time athletes have been practicing sport is also important in determining whether athletes reduce or not income. The more time athletes practice their sport and the more they are prone to reduce others' endowments. We also find that satisfaction reports can predict athletes' decisions: when a sporty subject report high changes in satisfaction, the probability for the subject to engage in reduction decision is high. The determinants of non-sporty subjects' decisions to reduce are less clear.

Although happiness literature is receiving much attention by researchers, there are few studies exploring the connection between satisfaction and behaviour. Results from these studies convey that happiness has a poor predictive power concerning individuals' behaviour (Celse, 2009; 2010). Subjects' reports of satisfaction do not provide enough information to predict their behaviour. In this paper, we observe that asking subjects to report their satisfaction may predict their future behaviour. Indeed athletes' satisfaction constitute an useful device in order to build inferences about their decisions to reduce others' income. It may be interesting to implement additional measures on non-sporty subjects so as to investigate why happiness reports fail at predicting their behaviour.

Besides it would be interesting to identify athletes' self-esteem in order to strengthen our conclusions. Self-esteem is acknowledged to be associated to various affective states that may explain behavioural observations. Scholars convey that low self-esteem is associated to depressive states (Bachman, 1970; Rosenberg, 1965; Rosenberg and Simmons, 1972), to anxiety disorders (Bachman, 1970; Luck and Heiss, 1972; Rosenberg and Simmons, 1972) and to lower levels of life satisfaction (Campbell, 1981). Low self-esteem is also known for increasing irritation and aggressive behaviours (Bachman et al., 1967; Rosenberg, 1985). In sport, scholars underline the importance of

self-esteem as a personality characteristic that might help subjects to face unfavourable events (Adie et al., 2008; Bardel et al., 2010). Athletes might behave differently according to their self-esteem: athletes with low self-esteem may be more prone to damage others' situations than athletes with high self-esteem.

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Appendix: Instructions (translated from French)

Welcome,

Thank you for accepting to participate in this experiment. This experiment is paid for real and lasts about half an hour. Your final payoff will depend on your endowment and on your decisions or on decisions of other participants, depending on your role. All decisions are anonymous and there are neither good nor bad answers. All amounts will be directly expressed in Euros. You will learn your final payoff at the end of the experiment and it will be paid for real in cash. If you have, during the experiment, any question, raise your hand and a monitor will come to answer you privately.

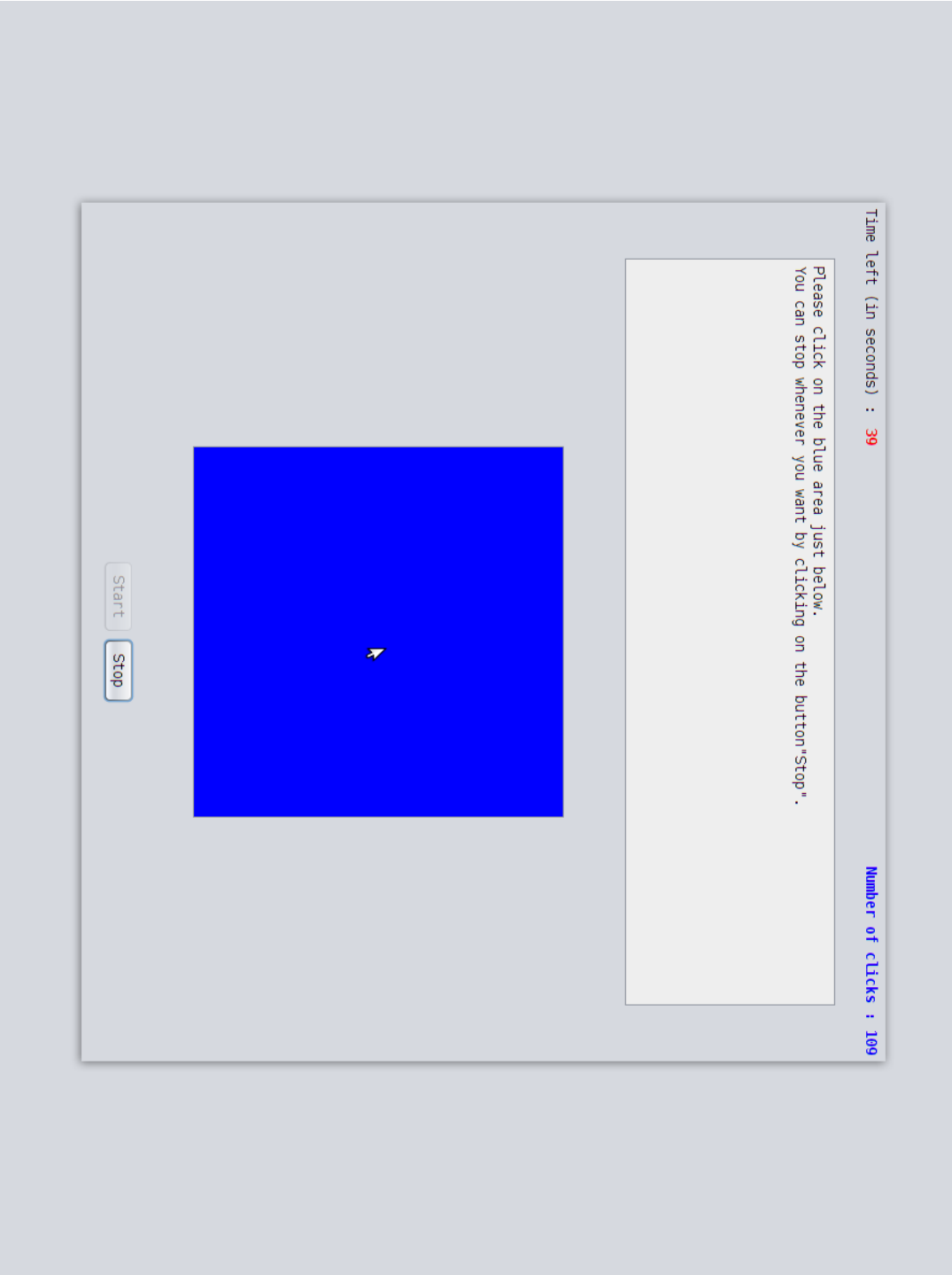
In that experiment, we distinguish two roles: role of player A and role of player B. From now when speaking about a player who received the role A, we will refer to player A and to player B for a player who received the role B. Roles are fixed during the whole experiment and are randomly attributed by the computer. There are as many players A as there are players B. Each player A is randomly associated to a player B. Whatever your role you are always associated with the same player.

Each player whatever his role is going to receive an endowment. Possible endowments range from 4 Euros (minimum endowment) to 32 Euros (maximum endowment). Endowments are attributed according to the number of clicks made by each player. More precisely, each player from both roles has one minute to click using his mouse. The higher the number of clicks made by a player, the higher his endowment. Then the attribution of endowments only depends on the number of clicks made by each player. There is a minimum number of clicks required for each endowment possible. The higher the endowment, the higher the number of clicks required to obtain that endowment. No player from this experiment is informed about the exact number of clicks required for each endowment.

Only players A are going to take a decision. Players B have no decision to take and are invited to remain silent during the experiment.

After each participant has finished reading instructions, the computer will randomly attribute the roles. Your role will be displayed on the screen. After being informed of your role, you will have one minute to click using your mouse. Then players A will be invited to take a decision, which is going to be explained after, while players B will wait. Once all players A have indicated their decision, then all players (players A and B) will be informed of their final payoff.

Appendix: Screenshot relative to the real-effort task.



Appendix: Screenshot relative to the evaluation of satisfaction

Your endowment: 4 euros
Your first evaluation: 10
B's endowment: 8 euros

Your endowment is 4 euros.
Player B's endowment is 8 euros.

Indicate your satisfaction level on the following scale. In order to report your satisfaction level, you have to move the slider along the scale. The scale ranges from -50 which indicates that you are extremely dissatisfied, to +50 which indicates that you are extremely satisfied.

Extremely dissatisfied -50 -25 0 25 50 Extremely satisfied

Neither dissatisfied nor satisfied

Value
-10

OK

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