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Faster, higher, stronger… and happier? Relative achievement and marginal rank effects

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ABSTRACT

Most prior research on the relationship between relative attainment and subjective wellbeing focuses on relative income. The direction of this relationship may, however, be positive or negative. Defining the target comparison group can be challenging. This study focuses on a sample where 'relative others' are especially salient – Olympic athletes – and investigates relative achievement using a different 'currency' – medals. While prior research shows that bronze are happier than silver medallists, we find no difference unless there is a relatively close race at the bottom of the podium in the competition between silver, bronze, and fourth. A nuanced distributional approach can be used to explore marginal rank effects.

1. Introduction

Research into the determinants of subjective wellbeing, or 'happiness', has advanced a great deal over recent decades. There is now abundant evidence on the association (and increasingly causal effect) of various socioeconomic variables, health, and behaviours with subjective wellbeing; see, for example, Dolan et al. (2008), Di Tella et al. (2010), Aknin et al. (2013),Loewenstein and Ubel, 2008, Oswald et al. (2015). Relatively less evidence is, however, available on the association between relative effects and subjective wellbeing.[1] What are the consequences of doing relatively better or worse than other people, and are these depicted in people's subjective reports of how they are feeling? This study contributes to this literature by examining the relationship between relative effects and subjective wellbeing amongst British Olympic athletes.

Given the central role of income in economics, it is perhaps not surprising that much of the existing evidence on relative effects and subjective wellbeing has focused on relative income. Increases in absolute income tend to have a positive, but diminishing marginal, association with subjective wellbeing (Diener et al., 1985; Dolan et al., 2008; Kahneman & Deaton, 2010; Jebb et al., 2018). This is not the case for comparison income. Increases in other people's income, such as that of neighbours and peers, generally tend to harm reported levels of subjective wellbeing (McBride, 2001; Bygren, 2004; Ferrer-i-Carbonell, 2005; Luttmer, 2005; Caporale et al., 2009; Layard et al., 2010; Card et al., 2012; Hudson, 2013; Cheung & Lucas, 2016; Clark et al., 2017). These negative effects are likely due to feelings of relative deprivation or anxieties that may accompany upward social comparisons (Runciman, 1966; Buunk et al., 1990; Luttmer, 2005; Smith et al., 2012), which assume income translates into visible consumption (Luttmer, 2005; Winkelmann, 2012; Bellet, 2017). There is also the possibility of downward comparisons to the less fortunate enhancing self-perceptions in some cases (Wills, 1981; Suls et al., 2002), although these may be less important than upward comparisons (Harris et al., 2008).

These explanations are supported by findings that the positions people occupy within their income hierarchies are important, too. An extensive literature shows that it is not only relative or 'reference' effects, such as average or median incomes, that impact upon subjective wellbeing. Rank in the hierarchy also exerts an independent effect, with those higher in rank evaluating their lives as going better than those

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[1] Relative height (Carrieri & De Paola, 2012), weight (Blanchflower et al., 2009; Meltzer et al., 2011), intelligence (Nikolaev & McGee, 2016), education (Kingdon and Knight, 2007; Salinas-Jiménez et al., 2011; Botha, 2014; Nikolaev, 2016), and unemployment (Clark & Oswald, 1994; Di Tella et al., 2001; Wolfers, 2003; Alesina et al., 2004; Eggers et al., 2006; Böckerman & Ilmakunnas, 2006) have been shown to exert an influence on subjective wellbeing.

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lower in rank. Rank effects sometimes matter more than absolute or relative effects and can depend on the level of income inequality within a country (Boyce et al., 2010; Wood et al., 2012; Macchia et al., 2019). The level of income inequality may also affect the behavioural consequences of rank effects, such as by influencing goals and investment decisions (Genicot & Ray, 2017). This is evidence that the impact of achievement on subjective wellbeing, and on other outcomes, needs to be understood in the context within which the achievement occurs.

Other studies, however, suggest no association between relative income and subjective wellbeing (Diener et al., 1993; Deaton & Stone, 2013; Kifle, 2014; Luo et al., 2016), or even a positive association between the two (Senik, 2004, 2008; Graham & Felton, 2006; Kingdon & Knight, 2007; Knies et al., 2008; Clark et al., 2009; Dittmann & Goebel, 2010; Davis & Wu, 2014; Ifcher et al., 2017; Bhuiyan, 2018). Defining the 'relative others' to whom people compare – i.e., the reference group – evidently lies at the core of this literature. The people contained in reference groups differ between studies, which should not be overlooked as comparisons to some groups may promote better subjective wellbeing, and others may detract from or have no influence on it. In the past, researchers have used small and large geographical areas or demographic characteristics (Luttmer 2005; Blanchflower & Oswald, 2004); varied the reference group used (Pérez-Asenjo, 2011; Deaton & Stone, 2013; Kudrna, 2018); and directly asked people to whom they compare themselves (e.g. Dornstein, 1988; Bygren, 2004; Knight et al., 2009; Clark & Senik, 2010).

Against this background, this study seeks to extend our knowledge and understanding of the association between relative effects and subjective wellbeing. We consider the ranking of Olympic athletes as a measure of relative achievement. Our focus on Olympic athletes is not accidental. First, their relative achievement is uncontroversial as it is defined by the medal won (i.e. whether gold, silver, or bronze) and, second, other Olympic athletes (peers) are likely to feature most prominently and saliently in the reference group.[2]

We are not the first to consider rankings of Olympic athletes and subjective wellbeing. Medvec et al. (1995) found that observers rating video footage of the emotional expressions of athletes during the Barcelona 1992 Olympic Games perceived bronze medal winners (3rd place) as being happier than silver medal winners (2nd place). The authors suggested that bronze medallists may feel lucky to have received a medal at all, considering the alternative of being outside the podium, whereas silver medallists think about how they could have won a gold medal. Such results are situated within a large body of evidence showing that counterfactual thinking ('what-if' outcomes) about an event can affect how we feel in domains ranging from educational success to missing a train (Kahneman & Tversky, 1982; Kahneman & Miller, 1986; Kahneman & Varey, 1990; Medvec & Savitsky, 1997; Roese, 1997; Gilbert et al., 2004).[3]

McGraw et al. (2005) analysed data from the Sydney 2000 Olympics, showing that medallists' objective podium positions corresponded with observer ratings of their happiness; that is, gold were happiest, followed by silver and then bronze medallists. Matsumoto & Willingham (2006) assessed facial expressions of judo athletes in the 2004 Athens Olympics using the Facial Action Coding System FACS (Ekman & Friesen, 1978), which uses coded aspects of expressed emotions as a guide to how people feel. For events where athletes compete two at a time, i.e., 'knock-out' events, gold and bronze victories were associated with 'Duchenne' smiles, while 'defeats' - silver medallists losing to gold medallists - were linked with sadness, contempt, or no emotions at all. Duchenne smiles purportedly reflect genuine positive emotion due to the activation of specific facial muscles (see Davidson et al., 1990; Ekman et al., 1990; Papa & Bonanno, 2008; Gunnery et al., 2013). Assuming this is true, the result is consistent with Medvec et al.'s (1995) original finding.

What might explain these conflicting results between silver and bronze medallists? We extend prior research by arguing that it is not just the relative objective category (i.e., gold, silver, or bronze) that plays a role in athletes' feelings as rated by observers. Rather, the margin by which athletes secured their medal – e.g., whether bronze are closer to fourth place than silver – is arguably the critical factor in the relationship between relative achievement and subjective wellbeing. In other words, it may be that counterfactual thoughts are particularly salient when 'close calls' occur within the context of a close race (Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Kahneman & Varey, 1990; Medvec & Savitsky, 1997; Roese, 1997). Our main contribution, thus, is to consider *marginal* rank effects, which may lead to *marginal* category-based counterfactual thoughts. We aim to show the circumstances when silver medallists appear less or more happy than bronze medallists; that is, whether the margin of win moderates the results. Our approach is similar to literature on goal-setting that considers how the distance of aspirations relative to others (and to one's past) affects behaviour (Lockwood & Kunda, 1997; Heath et al., 1999; Berger & Pope, 2011; Goux et al., 2017; Genicot & Ray, 2017); here, we consider how the distance of relative performance affects wellbeing, and goals may be one of the channels through which relative performance makes an impact. This is more of an internal channel than that of income, which is assumed to proxy visible consumption.

We consider edited video footage of a sample of over 100 Team Great Britain (Team GB) medal winners in the 2012 London Olympic and Paralympic Games. Although we are technically considering a population of all Team GB medal winners, we are nonetheless studying a sample of footage available from official sources. By considering Team GB medallists, we focus on the facial expressions of athletes of the same nation, thus avoiding potential cross-cultural differences in expressions associated with relative achievement when studying athletes of different nations as in the studies mentioned above. Furthermore, British medallists' facial expressions are arguably more significant in their home Games, plausibly because of the expectations of home spectators (Wann & James, 2018).

Our results suggest that the relative margins of athletes' rank placements matter for others' perceptions of how happy athletes feel. We find that, on average, silver were perceived as no differently happy to bronze medallists, while gold were perceived as the happiest of all. Silver were *not always* perceived to be similar in happiness to bronze medallists: Silver medallists who performed relatively worse – that is, who were relatively closer to bronze than to gold medallists – were in fact perceived as happier than bronze medallists. These results are robust to controls for athlete and event characteristics and to using an alternative happiness measure.

Table 1
Distribution of medallists by actual number of medals awarded and the available BOA footage from Team GB Olympic and Paralympic Games.

	Olympic Games		Paralympic Games	
	Actual	Available Footage	Actual	Available Footage
Gold	29	21	34	21
Silver	17	8	43	25
Bronze	19	10	43	28
Total	*65*	39	*120*	74

Source: http://www.teamgb.com/games/london-2012 and http://paralympics.org.uk/

[2] As with relative income and subjective wellbeing, it is possible that Olympic athletes also make other comparisons, too, such as to their past or anticipated performance.

[3] Note that counterfactual thoughts are a sufficient but not necessary condition for certain types of emotion (Sweeny & Vohs, 2012), and the effects of relative achievement on emotion and cognition extend beyond self-reports to evidence from brain imaging research (Dohmen et al., 2011).

2. Data and methods

Video footage of the award ceremony of Team GB medal winners in the 2012 London Olympic and Paralympic Games was obtained from the British Olympic Association (BOA) and the British Paralympics Association (BPA), respectively. In these Games, Team GB was awarded a total of 65 and 120 medals in the Olympic and Paralympic Games, respectively. Of these, BOA and BPA video footage of the awards ceremony was available for 39 (60%) and 74 (61.7%) of the Olympic and Paralympic medallists, respectively.

The distribution of gold, silver, and bronze medallists by the actual number of medals awarded and the available BOA footage from the Olympic and Paralympic Games is shown in Table 1; see Appendix A for further descriptive information related to the available footage.[4]

We employ several methodological innovations. First, the video footage of the athletes was edited such that medallists' relative standing at the podium was concealed from the subjects rating them; this information could potentially bias observers' ratings. We concealed the podium, medal awarded, surrounding athletes on the podium, and any text at the bottom of the screen revealing information about the athlete. These edits led to a clip focused on the facial expressions of athletes: a 'head and shoulders' shot.

Second, videos were muted so that any auditory information, such as cheers, would not influence ratings. Third, in order to avoid experimenter bias that could create a tendency to select information confirming any prior anticipation of the results, the clips were edited to only show the five very first seconds of the awards ceremony starting from the moment athletes stepped onto the podium. Five seconds are argued to be long enough for an athlete's expression to unfold (Ekman, 2003), and it ensures that all athletes' expressed emotions would be captured during a similar phase; a phase which has additionally been shown to be associated with a tendency for athletes to reveal their facial emotions (Fernández-Dols & Ruiz-Belda, 1995).

From 7 February to 21 March 2014, 756 individuals participated in this video rating task at the Behavioural Research Lab of a university in London, England. The lab recruits undergraduate, masters, and doctorate students, as well as members of the local community, to take part in the research using fliers, emails, and word of mouth. The study received university ethical approval. Participants received a monetary incentive of £20 as part of an award payment for this study, in conjunction with several other studies, and rated a subset of videos randomly selected using Qualtrics software.

Following each video footage, subjects rated medallists' 'happiness' based on the standard question used in prior research on Olympians' happiness (Medvec et al., 1995; McGraw et al., 2005): "*How would you rate the expressed emotion of the athlete(s) on a scale of 0 to 10, where 0 is agony and 10 is ecstasy?*" The face validity of this measure as one of 'happiness', however, is not straightforward, and so we include an additional question as a robustness check: "*How would you rate the expressed emotion of the athlete(s) on a scale of 0 to 10, where 0 is not at all happy and 10 is completely happy?*" The results did not generally differ substantively across the two measures and, for consistency with previous studies, we report those from the agony-ecstasy item in the results, referring to it as 'happiness'. Any significant differences between measures are noted within the text.

Because each rater rated multiple videos, we calculate the average rating for each video and analyse a dataset containing 113 observations corresponding to each video – see Table 1. We begin by first estimating category-based rank effects given by the following equation:

$$\text{Rating}_v = b_o + b_1\text{Gold}_v + b_2\text{Bronze}_v + d_{event} + \mu_{athlete} + u_v \quad (1)$$

Where *Rating* is the average happiness rating for each video, *v; Gold* is a dummy variable denoting whether an athlete was awarded a gold medal; *Bronze* is a dummy variable denoting whether an athlete was awarded a bronze model; d_{event} represents fixed effects for 20 event characteristics (swimming, judo, boxing, etc.) to account for unobserved heterogeneity between event types; $\mu_{athlete}$ are athlete characteristics including age[5], gender, and ethnicity; u is the error term. Eq. (1) is estimated using OLS, with standard errors clustered at the event type level.

Next, we explore the effect of the margin of win on perceptions of medallists' happiness, given in Eq. (2):

$$\text{Rating}_v = b_o + b_1\text{Gold}_v + b_2\text{Bronze}_v + b_3\text{CloseRace}_v + b_4\text{Gold}_v \times \text{CloseRace}_v + b_5\text{Bronze}_v \times \text{CloseRace}_v + d_{event} + \mu_{athlete} + u_v \quad (2)$$

Where *CloseRace* is a dummy variable equal to one when a relatively close race is present towards the bottom of the podium in the competition between silver, bronze, and fourth place, and equal to zero otherwise. This variable was created by ranking the distance between gold and silver, silver and bronze, and bronze and fourth. All instances where the distances between gold and silver were the largest differences were placed in the 'close race' category (as the distances between silver and bronze, and bronze and fourth, were relatively closer than the distance between gold and silver). All others were placed in the 'not close race' category (where the distances between silver and bronze, and bronze and fourth, were relatively further apart in comparison to the distance between gold and silver).

In formulating this variable, note that not all athletes participated in events that could be ranked according to 'distance' won in order to indicate a relatively close race between silver, bronze, and fourth. In two cases, the distance between places was identical.[6] In 20 other cases, medal allocations were not awarded simultaneously; that is, were not cases where medals were awarded based on a competition between two athletes/teams. To illustrate, consider the case of medals awarded in tennis or judo: a match between two athletes/teams determines who wins bronze, and a subsequent match determines who wins gold/silver. The important considerations here are that (a) there is a time lag for the bronze medal winner between their victory and award of the medal; and (b) participants in the final already know they have, at worst, secured the silver medal. These are properties that could arguably influence the emotions and facial expressions of those on the podium, which do not hold in settings where winning and losing are revealed simultaneously as, for example, for the case of the 100 m race. Events where medals were not awarded simultaneously, or where the distance between places was identical, were thus excluded from this analysis, resulting in a sample of 91 medallists.[7]

3. Results

In total, raters were 34.3% female, ranged in age from 18 to 69 years (mean 23.8, sd = 6.2), and 32.2% reported a White ethnicity. The sample of athletes was 44.1% female, ranged in age from 15 to 55 years (mean 28.0, sd = 8.9), and 93.8% were White. The average observed happiness score of all athletes was 6.2, sd = 1.3, which is indicative of consensus (see Fig. A1 in the Appendix). The average number of videos rated by each rater was 49.2 (sd = 4.1).

[4] We believe that the 'missingness mechanism' is related to licensing issues, which we judged as unlikely to be related to happiness (Little & Rubin, 2002).

[5] For teams, this is the average age of athletes in the team.

[6] These are the cases of Graeme Ballard's silver and Aled Davies' bronze. In both cases, the distance between silver and bronze was identical to the distance between 4th place and bronze.

[7] The excluded events include: hockey, tennis, boxing, equestrian, judo, cycling, boxing, taekwondo, table tennis, and wheelchair tennis. We also inspected the 72 missing videos to determine if they were non-simultaneous wins and at least 35 (nearly 50%) would have been dropped, reducing the proportion of missing data in models 3 and 4.

Table 2
Regressions for happiness from medal won and relatively close race.

	(1)	(2)	(3)	(4)
Gold	0.80*	0.76*	0.74	0.78
	(0.40)	(0.39)	(0.43)	(0.48)
Bronze	0.10	0.15	0.19	0.32
	(0.30)	(0.27)	(0.33)	(0.44)
Athlete age		-0.03***		-0.04***
		(0.01)		(0.01)
Athlete female		0.74***		0.67**
		(0.25)		(0.24)
Athlete white		-0.74**		-0.41
		(0.34)		(0.44)
Close race			0.28	0.30
			(0.56)	(0.37)
Gold * Close race			-0.18	-0.22
			(0.63)	(0.52)
Bronze * Close race			-0.61**	-0.77**
			(0.28)	(0.34)
Constant	5.73***	7.10***	5.67***	6.84***
	(0.29)	(0.36)	(0.28)	(0.50)
N	113	111	91	90
R^2	0.28	0.39	0.27	0.37

Notes: Standard errors are in parentheses. Reference category is silver. Event clustering and fixed effects. *** $p < 0.01$, ** $p < 0.05$.

3.2. Relatively close races

The results of regressions predicting perceived happiness from an interaction between the close race variable and medal won, without and with controls, are shown in Table 2, models (3) and (4), respectively. Only the interaction between close race and bronze is statistically significant. These results suggest that when there is a relatively close race between silver, bronze, and fourth place, silver are perceived as being happier than bronze medallists. Alternatively, when there is not a relatively close race at the bottom of the podium, the perceived happiness of silver and bronze medallists does not differ.[9] These results are depicted in Fig. 1, which visualises model (4) from Table 2

3.3. Additional specifications

Athletes' happiness may be influenced by performance relative to expectations, as well as their actual performance. To capture past performance, we categorised all videos according to whether they depicted a personal best and/or world record. 12 videos in our sample met these criteria (10.8%). Results of regressions explaining variance from medal won and personal best/world record are shown in Table 3.[10] There was no association of personal best/world record with perceived happiness

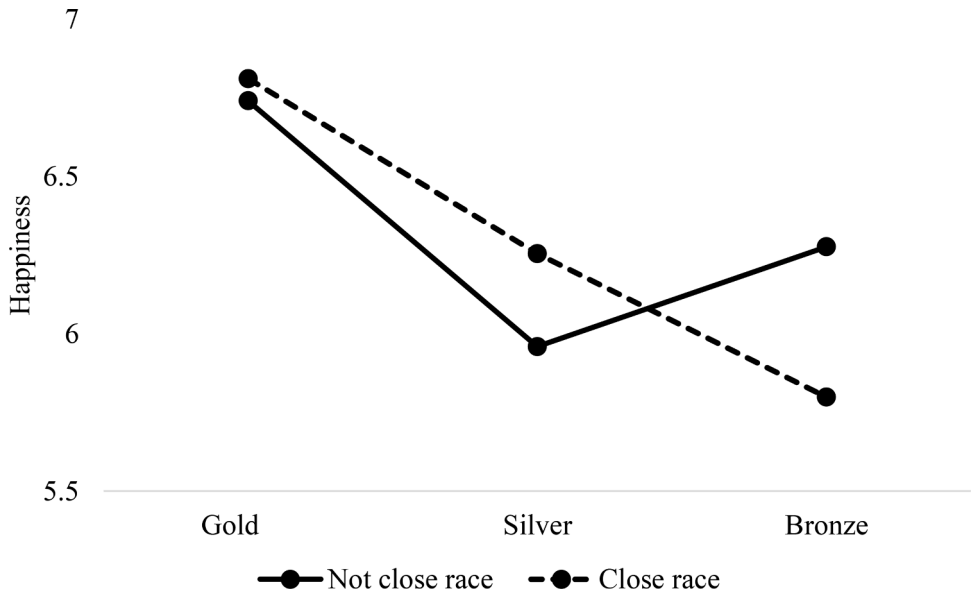

Fig. 1. Predicted values of happiness from medal won conditional on relatively close race between silver, bronze, and fourth place (with controls). From model (4) in Table 2.

3.1. Gold, silver, bronze

Results of regressions predicting perceived happiness from gold, silver, and bronze medallists without and with the controls are shown in Table 2, models (1) and (2), respectively. Gold were perceived as being happier than silver and bronze medallists without and with controls. There was not, however, a significant difference in perceived happiness between silver and bronze medallists.[8]

apart from in model (4), where the association was significant and positive.[11] Despite the contribution of past performance to happiness in

[8] When restricting the sample to the 91 videos of events where medals were awarded simultaneously (as in models 3 and 4 in Table 2), gold were not significantly happier than silver medallists on the alternative happiness measure without (b=0.62, se=0.39) and with controls (b=0.62, se=0.45), nor on the main happiness measure with controls (b=0.69, se=0.39).

[9] In post-estimation contrasts, the difference between silver and bronze was never significant when it was not a close race ($p>0.05$). When it was a close race, silver were always less happy than bronze but only significantly so in model 4 and not model 3 ($p<0.05$), perhaps indicative of the additional explanatory power of the covariates in combination with the medal and close race variables or small sample size.

[10] These models exclude athlete characteristics to preserve degrees of freedom.

[11] Results for personal best / world record with controls were more precise when using the alternative happiness measure (b=0.33, se=0.09, $p<0.01$); nevertheless, the close race interaction with bronze remained significant. When restricting the sample to 91 medallists (as in models 3 and 4 in Table 3), personal best / world record was not significant for the main happiness measure but it was for the alternative happiness measure (b=0.37, se=0.15, $p<0.05$).

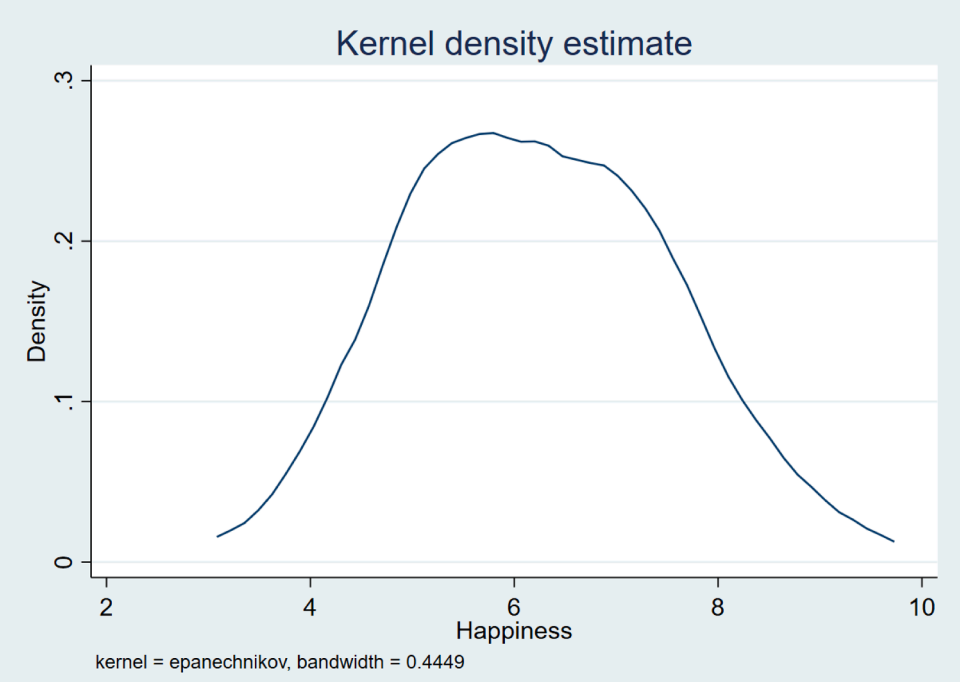

Fig. A1. Kernel distribution.

Table 3
Regressions for happiness from medal won, relatively close race, and personal best/world record.

	(1)	(2)	(3)	(4)
Gold	0.80*	0.79*	0.74	0.72
	(0.40)	(0.45)	(0.43)	(0.44)
Bronze	0.10	0.10	0.19	0.20
	(0.30)	(0.30)	(0.33)	(0.32)
Personal best / world record		0.05		0.33*
		(0.29)		(0.16)
Close race			0.28	0.31
			(0.56)	(0.57)
Gold * Close race			-0.18	-0.27
			(0.63)	(0.62)
Bronze * Close race			-0.61**	-0.61*
			(0.28)	(0.29)
Constant	5.73***	5.73***	5.67***	5.62***
	(0.29)	(0.28)	(0.28)	(0.28)
N	113	113	91	91
R^2	0.28	0.28	0.27	0.28

Notes: Standard errors are in parentheses. Reference category is silver. Event clustering and fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.1.

this model, the interaction between close race and bronze remained significant.

Athletes' happiness may also be influenced by contextual features of the Olympic environment, such as daily weather patterns. Past research shows that some people are happier on warmer and sunnier days, although this is not found in all samples, effect sizes can be small, and there are individual differences (Klimstra et al., 2011). Nevertheless, we assess our results for this possibility by importing data on daily average temperature and precipitation from the National Center for Environmental Information.[12] The results are shown in Table 4. There is no association of temperature and precipitation with happiness apart from the model with the interaction between bronze and close race (model 4), where higher temperature is associated with greater happiness.[13] A ten degree (Fahrenheit) temperature increase is associated with a 0.7 happiness increase. The interaction between bronze and close race remained significant.

Table 4
Regressions for happiness from medal won, relatively close race, and weather.

	(1)	(2)	(3)	(4)
Gold	0.80*	0.65	0.74	0.69*
	(0.40)	(0.38)	(0.43)	(0.36)
Bronze	0.10	0.09	0.19	0.31
	(0.30)	(0.23)	(0.33)	(0.27)
Temperature		0.05		0.07*
		(0.03)		(0.04)
Precipitation		7.64		7.79
		(4.83)		(5.06)
Close race			0.28	0.59
			(0.56)	(0.42)
Gold * Close race			-0.18	-0.42
			(0.63)	(0.46)
Bronze * Close race			-0.61**	-0.94***
			(0.28)	(0.18)
Constant	5.73***	2.61	5.67***	1.47
	(0.29)	(2.19)	(0.28)	(2.11)
N	113	113	91	91
R^2	0.28	0.33	0.27	0.32

Notes: Standard errors are in parentheses. Reference category is silver. Event clustering and fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.1

4. Discussion

Thinking in relative terms, and about what could have been, can lead people to feel differently about their achievements than an objective assessment of what they have achieved might suggest. This study

[12] https://www.ncdc.noaa.gov/data-access

[13] The results in Table 4 held in a restricted sample of 91 medalists (as in models 3 and 4 in Table 4), and the results held when using the alternative happiness measure.

investigated such issues of counterfactual thinking and relative success by analysing observer ratings of over 100 Team GB Olympian and Paralympians' happiness at the 2012 London Olympic Games, which provides a salient comparison group. Prior research offers mixed results, on the one hand suggesting that silver are less happy than bronze medallists (Medvec et al., 1995; Matsumoto & Willingham 2006), and on the other, suggesting that perceived happiness corresponds with objective podium position in that silver are happier than bronze medallists (McGraw et al., 2005).

We proposed that the effect of performance on happiness may have been influenced by the relative margin by which athletes secured their medal; that is, marginal rank effects. Without considering the marginal rank effects, our results showed that silver medallists appeared about as happy as bronze medallists and gold medallists were the happiest of all. When considering relative margins, however, we found that silver medallists who performed worse – that is, relatively further away from gold – were perceived as being happier than bronze medallists. Silver medallists who were involved in a relatively closer race at the bottom of the podium appeared happier than those involved in a closer race at the top. This result is consistent with findings from the literature on close calls, which show that just missing out on a higher performance category can feel subjectively worse even though it is objectively better than placing lower in the performance category (e.g., Medvec & Savitsky, 1997).

One explanation for our findings is that silver who are relatively closer to bronze medallists compare themselves downward to bronze medallists, and these comparisons positively influence their happiness because they have performed better than bronze medallists (Buunk et al., 1990). Olympic athletes may have multiple goals, such as winning a gold medal and convincingly winning a medal, which each affect processes of social comparison and counterfactual thinking in different ways (Markman & McMullan, 2003). We did not, however, have direct access to athletes' internal motivations. Counterfactual thoughts and social comparisons are not the only interpretations. Athletes' happiness may also be influenced by goals and expectations related to factors beyond the intrinsic value of the win or loss relative to other competitors, such as pecuniary benefits or media attention associated with performance in sporting competitions. One limitation of our research is that it did not assess internal motivations.

When the relatively closer race was at the top of the podium, however, silver were perceived to have similar happiness to bronze medallists. It could be that these silver medallists compared upward to gold medallists (rather than down to bronze), which dampened their happiness. Considering these results in the context of prior research, which has found that silvers are both unhappier (Medvec et al., 1995; Matsumoto & Willingham, 2006) and happier than bronze medallists (McGraw et al., 2005), it appears that the relative happiness of silver versus bronze medallists is sensitive to the relative margin of the win. As a result, we should be cautious about inferring that it feels worse to come in second than third place. In fact, when the performance of second, third, and fourth place competitors is relatively close, our results suggest it is likely that it feels better to come in second than third.

Happiness could have been affected by achieving goals that are relative to past reference points and not only relative to other athletes' performance during the competition (Heath et al., 1999). We explored this possibility by including a measure of whether the performance was a personal best and/or world record. The results showed that athletes who achieved a personal best and/or world record appeared to be happier than those who did not. Relatively close races at the bottom of the podium, however, were still associated with silver medallists being happier when controlling for past performance. It is also possible that event characteristics may have influenced the results. We assessed the influence of event characteristics by including event fixed effects, as well as variables for temperature and precipitation on the day of the competition. The results for a relatively close race held when including event characteristics, and weather was only associated with happiness in the model with controls and the interaction between bronze and relatively close race. Consistent with some prior literature, athletes were happier when it was warmer (Klimstra et al., 2011). In general, however, the results suggested that athletes were more influenced by their performance than the weather, which may indicate the importance of these competitions for their careers.

These results may have implications for the literature on the impact of achievement in other 'currencies', such as income, on subjective wellbeing. Our results suggest that higher rank income may be associated with better subjective wellbeing when incomes are similar at specific points of the distribution (close races), however, if incomes are dissimilar, higher rank income might not be associated with feeling any better. For example, the second-highest paid person in a company might not feel any better than someone earning less than them if their pay is relatively closer to the top earner than to the third highest-paid person. In other words, there may be non-linearities in the relationships of relative and rank incomes with subjective wellbeing that have not yet been fully accounted for, and that could be explored by a more nuanced distributional approach that explores marginal rank effects.

There are several outstanding factors that future research could investigate. In addition to their absolute, marginal, or relative performance, the context of the awards ceremonies could affect medallists' happiness. When the audience claps for medallists as they step onto the podium, they clap for bronze first, silver second, and gold third. Thus, if people clap loudly for the first bronze and the last gold but less so for silver, in the middle, the audience's reaction rather than the athlete's performance could determine their facial expressions. It would also be possible to test marginal rank effects by creating a quantitatively relative variable, which divides the absolute performance (e.g., a 70-second lap) by the worst performance (e.g., a 120-second lap) to assess whether happiness is increasing with relative performance among medallists or not. Analysing this quantitatively relative variable would show whether it is the marginal or relative performance - or both - that matter for happiness. Within events, it would be possible to standardise scores to characterise their magnitude. Controlling for these scores would illustrate rank effects irrespective of the absolute performance driving the rank, which our data do not illustrate. Such a measure might be difficult to construct between events due to outcome heterogeneity (e.g. in terms of minutes, distance, or points); nevertheless, the absence of a control for absolute performance is an important limitation to this literature.

Future research should continue to use other samples. A strength of our sample is that it included over 700 raters and over 90 videos, whereas previous research included up to 20 raters and 41 videos (Medvec et al., 1995), or up to 26 raters and 90 videos (McGraw et al., 2005). However, we were not able to include all the videos from the London 2012 Games due to the availability of footage from the British Olympic and the British Paralympics Association. While athletes themselves could not 'select' into being included in our sample, the available footage may have been different in influential ways from the unavailable footage; for example, included events may have been more memorable, unique, or contained a different number of relatively close races at the bottom of the podium. The availability of footage is a challenge in this area of research not unique to our study. With more footage it would be possible to explore even more nuanced effects, such as different ways of measuring close races.

Finally, it would be possible to explore these effects over time. The length of time between knowing that one has secured a medal and stepping onto the podium to receive it may affect happiness. Athletes

who have had longer to adjust to their performance may have adapted to their win and thus be less happy - or unhappy - over time. Although we exclude non-simultaneous wins in this study, this point could be explored in a more nuanced way by collecting data on the time between knowing one has secured a medal to receiving the medal on the podium. Furthermore, while an absolute or relative loss may create negative emotions at the time of the loss, later on it could create contribute to positive emotions. For example, the loss may be seen as motivating if winning still appears achievable (Lockwood & Kunda, 1997) or provides the impetus to try even harder next time (Berger & Pope, 2011), or facilitate more reasonable goal-setting and expectations (Goux et al., 2017), which could all influence longer-term happiness. Strulik (2015) argues that status concerns may have a longer-run positive impact on the happiness of society even if they do not have a short-term positive impact on the happiness of individuals. Future research could explore this possibility by surveying medallists over time following their award.

The results should be interpreted with caution as performance is not exogenous to the individual, and medallists' happiness could technically be influenced by the same unobserved factors that influence performance, such as effort and ability – though these may also be seen as relative. We are unable to account for athletes' baseline levels of happiness, and reverse causality could affect the results. Moreover, the findings of this study rely on the validity of informer ratings of happiness. Facial expressions can proxy peoples' emotions (Izard, 1971; Sandvik et al., 1993; Lepper, 1998); however, the convergence of these ratings to the self-reported happiness of the people being rated is not perfect, and it is difficult to establish a perfect validation criterion for assessments of wellbeing (Schneider & Schimmack, 2009). The degree to which such ratings are sufficiently valid for the case of groups of people – as in team athletes which we partly examine here – is an area that future research could consider, especially given that people appear to favour individuals' success more than they do groups' success (Walker, 2019). It is not clear, for example, whether in reporting how happy they perceive the group to be, raters look for – and hence focus their attention on – the person perceived to be the happiest within the group.

This is all for the future, and, as with most things in life, context matters. In the context of sports competitions, there is little doubt that you will be happiest if you win. But if you cannot win, then our study suggests that you might feel better by avoiding a close finish, taking your foot off the gas and coming in quite a bit behind your opponent.

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Appendix A

CE: Table A1; Table A2.

Table A1
Athlete videos included in study.

Olympic Athletes	Medal	Event	Paralympic Athletes	Medal	Event
H Glover & H Stanning	Gold	Rowing	E Simmonds	Gold	Swimming
B Wiggins	Gold	Cycling	E Simmonds	Gold	Swimming
P Wilson	Gold	Shooting	J Craig	Gold	Swimming
S Burke, E Clancy, P Kennaugh & G Thomas	Gold	Cycling	H Frederiksen	Gold	Swimming
V Pendleton	Gold	Cycling	M Colbourne	Gold	Cycling
A Gregory, T James, P Reed & A Triggs-Hodge	Gold	Rowing	N Fachie & B Storey	Gold	Cycling
K Copeland & S Hosking	Gold	Rowing	J-J Applegate	Gold	Swimming
D King, J Rowsell & L Trott	Gold	Cycling	J Fox	Gold	Swimming
J Ennis	Gold	Athletics	S Storey	Gold	Cycling
G Rutherford	Gold	Athletics	H Cockroft	Gold	Athletics
M Farah	Gold	Athletics	R Whitehead	Gold	Athletics
S Brash, P Charles, B Maher & N Skelton	Gold	Equestrian	A Davies	Gold	Athletics
A Brownlee	Gold	Triathlon	D Weir	Gold	Athletics
L Trott	Gold	Cycling	S Storey	Gold	Cycling
C Dujardin	Gold	Equestrian	O Hynd	Gold	Swimming
N Adams	Gold	Boxing	H Lucas	Gold	Sailing
J Jones	Gold	Taekwondo	H Cockroft	Gold	Athletics
E McKeever	Gold	Canoeing	D Weir	Gold	Athletics
M Farah	Gold	Athletics	J Peacock	Gold	Athletics
L Campbell	Gold	Boxing	J Pearson	Gold	Athletics
A Joshua	Gold	Boxing	D Weir	Gold	Athletics
M Jamieson	Silver	Swimming	C Henshaw	Silver	Swimming
D Florence & R Hounslow	Silver	Canoeing	C Cashmore	Silver	Swimming
M Hunter & Z Purchase	Silver	Rowing	H Russell	Silver	Swimming
A Murray & L Robson	Silver	Tennis	A Moores	Silver	Swimming
C Ohuruogu	Silver	Athletics	S Kindred	Silver	Swimming
V Pendleton	Silver	Cycling	S Millward	Silver	Swimming
F Evans	Silver	Boxing	H Frederiksen	Silver	Swimming
S Murray	Silver	Pentathlon	L Watkin	Silver	Swimming
G Nash & W Satch	Bronze	Rowing	N Kindred	Silver	Swimming
A Campbell	Bronze	Rowing	S Millward	Silver	Swimming
R Adlington	Bronze	Swimming	E Simmonds	Silver	Swimming
M Whitlock	Bronze	Gymnastics	M Colbourne	Silver	Cycling
E Clancy	Bronze	Cycling	A McGlynn & H Scott	Silver	Cycling
J Brownlee	Bronze	Triathlon	J-A Butterworth	Silver	Cycling
R Grabarz	Bronze	Athletics	S McKeown	Silver	Cycling
B Storry, E Maguire, L Unsworth, C Cullen, A Panter, H Macleod, H Richardson, K Walsh, C Rogers, L Bartlett, A Danson, G Twigg, A Ball, S	Bronze	Hockey	O Hynd	Silver	Swimming

(continued on next page)

Table A1 (*continued*)

Olympic Athletes	Medal	Event	Paralympic Athletes	Medal	Event
Walton, N White & S Thomas					
L Heath & J Schofield	Bronze	Canoeing	J Crisp	Silver	Swimming
T Daley	Bronze	Diving	S Ingram	Silver	Judo
			S Reid	Silver	Athletics
			W Bayley	Silver	Table tennis
			G Ballard	Silver	Athletics
			S Millward	Silver	Swimming
			P Blake	Silver	Athletics
			H Frederiksen	Silver	Swimming
			D Greaves	Silver	Athletics
			H Russell	Bronze	Swimming
			E Johnson	Bronze	Swimming
			R Welbourn	Bronze	Swimming
			M Whorwood	Bronze	Swimming
			N Jones	Bronze	Swimming
			S Rodgers	Bronze	Swimming
			S Rodgers	Bronze	Swimming
			J Clegg	Bronze	Swimming
			M Walker	Bronze	Swimming
			E Simmonds	Bronze	Swimming
			B Quilter	Bronze	Judo
			ZNewson	Bronze	Powerlifting
			A Davies	Bronze	Athletics
			G Prescott	Bronze	Athletics
			R Womack	Bronze	Athletics
			C Williams	Bronze	Athletics
			J Cundy	Bronze	Cycling
			P Davies	Bronze	Table tennis
			O Hynd	Bronze	Swimming
			D Devine	Bronze	Athletics
			B Jones	Bronze	Athletics
			L Watkin	Bronze	Swimming
			B Rushgrove	Bronze	Athletics
			P Blake	Bronze	Athletics
			O Abidogun	Bronze	Athletics
			L Shuker & J Whiley	Bronze	Wheelchair tennis
			J Campbell & S Head	Bronze	Table tennis
			H Lee	Bronze	Swimming

Table A2
Descriptive statistics related to footage.

Type of Sport	%	*Size of Team*	%
Athletics	24.78	0	85.84
Boxing	3.54	1	0.01
Canoeing	2.65	2	9.73
Cycling	14.16	3	0.89
Diving	0.88	4	2.65
Equestrian	1.77	16	0.88
Gymnastics	0.88		
Hockey	0.88		
Judo	1.77		
Pentathlon	0.88		
Powerlifting	0.88		
Rowing	5.31		
Sailing	0.88		
Shooting	0.88		
Swimming	32.74		
Table tennis	2.65		
Taekwondo	0.88		
Tennis	0.88		
Triathlon	1.77		
Wheelchair tennis	0.88		

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