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Research article

Placebo effects in competitive sport: Qualitative data

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Abstract
The paper examines the placebo effect in sports performance. The possibility that the placebo effect is a more common phenomenon than the quantity of published research would suggest is briefly addressed. It is suggested that the placebo control design often used in sports performance research masks any placebo effects and thus presents a false picture of the mechanisms underlying performance-enhancing interventions in the real world. An electronic survey was sent to 48 competitive, international and professional athletes. Questions related to the placebo effect in competitive sport. Thirty responses were received. Data indicate that the majority (97%) of respondents believe that the placebo effect can exert an influence on sports performance, and that a significant number (73%) have experienced what they defined as a placebo effect. Inductive content analysis reveals that these experiences fall into several categories such as explicit placebo effects, inadvertent false beliefs, ritual and reverse placebo effects. Furthermore, 10 respondents (33%) offer explanations as to the nature of the placebo effect. Again, inductive content analysis reveals that these explanations fall into several categories including deliberate changes in competitive strategy, belief/expectancy, faith in a third party, and marketing. Overall, responses support previous experimental research and anecdotal reports that have found a relationship between belief and sports performance. It is suggested that further research be structured to not simply control for the placebo effect, but to elucidate it.

Key words: Belief, experimental design, performance psychology, research methods.

Introduction

The placebo effect is a favourable outcome arising purely from the belief that one has received a beneficial treatment (Clarke et al. 2000). The concept of the placebo effect is well established in medicine, in which it is standard practice that all new drugs be tested in placebo-controlled trials to ensure that the pharmacological effects of the drug exceed any placebo effects (Iverson, 2005). The practice of prescribing drugs to treat conditions for which the drug has no recognised biological mechanism - for example, the use of antibiotics to treat viral infections - suggests that the placebo effect is also utilised as a direct therapeutic intervention (Shapiro and Shapiro, 1997). However, any claim that the placebo effect is either well documented or universally accepted is premature. As suggested by Ader (2000), despite increasing recognition in the medical field that drugs do not act in a vacuum but upon complex organisms, the placebo effect has yet to be studied to the extent that the pervasiveness of the effect would warrant.

Despite tacit acceptance of the placebo effect evidenced by the widespread use of the placebo-controlled trial in many scientific disciplines, in experimental research the placebo effect *per se* has often been viewed with scepticism, with many authors suggesting that such observed effects are simply the result of methodological artefacts (e.g., Kienle and Kiene, 1997). This situation is arguably worsened by the often stark contrast between the small volume of credible empirical evidence for the placebo effect and the large volume of unsubstantiated claims made for the efficacy of various products and techniques that seem to have no clear mechanism and which may simply bestow any benefit via the placebo effect, a form of 'guilt by association'. In fact, for many, the proliferation of such products and techniques has placed the placebo effect firmly within the realms of superstition, and even fraud.

Placebo effects in sports research

Six published empirical studies have addressed the placebo effect in sport. These have demonstrated, for example, that athletes who falsely believed that they had been administered anabolic steroids (Ariel and Saville, 1972; Maganaris et al., 2000), or that they had ingested carbohydrate (Clark et al., 2000), caffeine (Beedie et al., 2006), or a hypothetical 'new ergogenic' (Foster et al., 2004), or who believed they were using a respiratory training device (Sonetti et al., 2001), performed better than baseline or controls. These data suggest that the placebo effect is a factor in sports performance. Furthermore, it is not unreasonable to suggest that the widespread use of the placebo-controlled design has masked placebo effects in much research. That is, in the placebo-control design, the placebo condition is treated as a baseline with which to compare the manipulation. However the placebo condition, although a passive condition from a pharmacological/biological/mechanical perspective, is often active psychologically, and may be associated with significantly improved performance over true, although usually unmeasured, baseline. Further, these effects may be negated entirely by the classic placebo control design in that the process of informing participants that they *might* receive an inert treatment may induce such uncertain expectations of benefit that these participants fail to demonstrate a placebo effect (Kirsch and Weixel, 1988).

It is suggested above that placebo effects are 'masked' in much sports science research, and that this masking presents a false picture of the degree to which placebo effects might impact on real world sports performance. However, it has been suggested that this might not be the case and that placebo effects are more likely to

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be evidenced in laboratory conditions than in competition (Hopkins, 1999). On the basis that many psychological processes that could impact on the placebo effect, such as motivation, confidence, anxiety and perceived pain, might be intensified during competition, this claim has some merit. If this is the case and placebo effects are less likely to occur in competitive sport than in laboratory conditions, it is justifiable to suggest that there is no real imperative – beyond scientific curiosity – to carry out systematic placebo effect research in sport. If however this is not the case, it might be argued that the opposite holds true, and that to fully explore the psychological mechanisms underlying sports performance in both the laboratory and the field, systematic placebo effect research is warranted.

Placebo effects in sports competition

Evidence, albeit anecdotal, suggests that placebo effects do in fact influence performance in competition. A well-documented example is the account by Vogt (1999), of how he tricked French cyclist Richard Virenque into believing that he had taken a stimulant. (It is recognised that Vogt is describing a morally dubious and illegal procedure. It is hoped that the reader will accept that the example provided - one that was well documented following the 1997 police investigation into the Tour de France - is presented as a phenomenon of scientific interest, and that the author is not condoning the use of illegal drugs in sport.):

"I was supposed to inject this rubbish into Richard's backside one hour before the start…At the given moment I gave Virenque his injection. That day he rode the time trial of his life, finishing second on the stage to Ullrich. The German started 3 minutes after Richard and caught him, after which the pair had a memorable ding-dong battle all the way to the finish. "God I felt good! That stuff's just amazing" he bubbled. "We must get hold of it." His result did have something to do with the magic capsule – but there is one thing he doesn't know, unless he reads this. I had got rid of the fabulous potion and swapped it for one which contained a small amount of glucose. There is no substitute for self belief…" (p. 104)

Similarly, in discussing West Germany's unprecedented win in the 1954 soccer World Cup final, the then German Football Federation doctor, Professor Franz Loogen stated:

"I injected the men with vitamin C because it was supposed to raise their stamina levels…you cannot measure the effect it has, but the players believed in it" (World champions or soccer cheats? The Daily Telegraph, United Kingdom: 1st April 2004. www.dailytelegraph.com/world champions or soccer cheats.htm)

Both these quotes – and it is recognised that being anecdotal, their reliability is open to question from a number of perspectives – hint at the potential for athletes' beliefs to impact on their performance in competitive situations. Similar anecdotes are relatively common; several publications, for example, Murphy and White (2000) describe exceptional or unprecedented performances, and given the evidence they cite, it is not unreasonable to suggest that the placebo effect may have been a factor in several cases. Placebo effects might also be implicated in the use by athletes of substances or technologies that have no clear biological or mechanical basis. A recent example is the use of 'energy patches' by NFL football players, who have claimed for example that "I noticed an increase in my endurance and ran the best splits I have ever run. I also noticed an increase in overall cardio…, the patches just allow me to run more and run longer" (Obafemi Ayanbadejo, cited on http://www.lifewave.com/teamuk, accessed 5th December, 2005). In light of similar claims, authors in sport and beyond have suggested that such products often exert any influence on performance via the placebo effect (e.g., Clark et al., 2000; Evans, 2003). Key to such suggestions however is the premise that *these products often do exert some influence on performance*, albeit by psychological mechanisms. That such mechanisms are both recognised yet little understood adds further weight to the argument for systematic placebo effect research.

Problems in researching the placebo effect

It is suggested above that anecdotal evidence for the placebo effect in sport is plentiful. However, anecdotal evidence does not constitute scientific data; Vogt's (1999) testimony is, for example, compelling, but it is arguably problematic to unravel the number of possible motivations for his reporting the incident in question. To increase confidence in such testimony further 'hard' data is required, in this case for example, the results of Virenque's doping control. Although in itself it is not conclusive, such 'hard' data would provide a degree of triangulation to further support the idea that the performance in question resulted from the placebo effect and not from an active drug. On a larger scale, to reliably ascertain the degree to which the placebo effect influences sports performance generally, a significant volume of such 'hard' data and triangulation is required.

The placebo effect *per se* is however complex to investigate. A major problem is that of classification, that is, what type of effects can be classified as placebo effects? Hopkins (1999) suggests that, in competition, any placebo effects might be over-ridden by motivational factors. It could however be argued that changes in motivation are part and parcel of the placebo effect (as is perhaps implicit in Hopkins' suggestion). Conversely, if the concept of the placebo effect is limited to a physiological process, that is to changes in neural, endocrine, or immune activity (see Evans, 2003), such effects are somewhat problematic to identify and distinguish from the somatic consequences of other psychological processes. For example, on the basis that any one somatic event might also be associated with changes in an athlete's motivation, and that this change in motivation might also be the indirect result of a placebo effect, researchers are faced with the problem of distinguishing between somatic events driven directly by placebo effects and such somatic events driven by changes in motivation. A potential solution to this problem might be that, in a similar way to which Vogt's qualitative testimony from competitive sport might benefit from triangulation with 'hard' data, such 'hard' data derived from empirical research might benefit from triangulation with qualitative data from participants. In fact, it might be further argued that a placebo

effect should only be so described if the participants themselves do not propose an alternative explanation, such as increased motivation, a learning or training effect, or simply 'just a good day…'.

Validating placebo effects through experiential data

Recent research has investigated the placebo effect from an experiential perspective. Beedie et al. (2006) interviewed competitive cyclists following their participation in a study that purported to investigate the effects of caffeine on cycling performance, but which was in fact an exploration of the placebo effect. Participants produced significantly greater power in three experimental conditions in which they were informed that they had received varying levels of caffeine but had in fact received a placebo, than in three true baseline (i.e., no-placebo) conditions. The authors concluded that the observed improvements in performance were attributable to the placebo effect. Beedie et al.'s subsequent analysis of pre-trial questionnaires and post-study interviews revealed that 5 of 6 participants believed that they had experienced a placebo effect in one or more of the three experimental trials. The remaining participant indicated that he did not believe he had experienced any placebo effect. Significantly, the latter participant had previously indicated low a priori expectation of an ergogenic effect, a factor that hints at a belief-performance relationship, whereby the stronger the a priori expectation of an effect, the greater the chances of that effect materialising. Interestingly however, one participant who reported low a priori expectation of a performance effect also experienced a large placebo effect, clearly casting doubt on the hypothesised belief-performance relationship. Subsequent interview data however revealed that during his first experimental trial he had experienced unanticipated feelings of strength and power and had, at the time, attributed these feelings to the 'caffeine' capsule. On subsequently being informed that the capsule was a placebo, he suggested that his performance had resulted from his awareness early in that trial that he felt unusually strong and his subsequently attributing these feelings to the ingestion of caffeine. The belief that caffeine was after all - and despite his low a priori expectation - a powerful ergogenic aid, combined with his suspicion that he had ingested a large dose, led to a significant increase in confidence and motivation enhancing his performance.

It can be seen that by seeking experiential data to support experimental data, Beedie et al (2006) were better able to explain observed performances. In fact, without such supporting data, the observed belief-performance relationship would not have emerged. In summarising their findings, Beedie et al. recommended that future research should seek to further examine participants' experiences of placebo effects in laboratory research. That is, experimental data should be triangulated with questionnaire or interview data in the style described above, to better describe the mechanisms underlying any observed performance effects. The authors also suggest that such research be extended to the field to gain some insight into the degree to which athletes might experience placebo effects in competition. This recommendation is perhaps made more relevant in light of Hopkins' (1999) suggestion above that motivational factors might override the placebo effect in a competitive event. It is also relevant in light of the anecdotal and unreliable nature of much of the evidence for placebo effects in competitive sport.

Six studies have addressed the placebo effect in sport. Of these, only one, Beedie et al. (2006) has used qualitative methods to explore the effect, and none have examined the placebo effect in competition. The primary aim of the present study was to ascertain whether athletes experience placebo effects in competition. Secondary aims were to identify the types of phenomena athletes describe as placebo effects, and to elucidate the mechanisms athletes believe might underlie these.

Methods

Participants

Participants (N = 30, age M = 31.4 yr., SD = 5.3 yr.) were 17 male and 13 female athletes. They included amateurs and professionals, ex-national champions, national record holders, international representatives, medallists from both World Championships and Commonwealth Games, and one current World Champion. Participants represented the sports of boxing, cycling, decathlon, mountain biking, rowing, rugby, road running, soccer, squash, triathlon, and weightlifting. Participants were from the UK, Ireland, New Zealand, Australia, Denmark, Germany and the USA.

Procedure

Institutional ethical approval was granted**.** Data were collected via an email survey. The benefits and limitations of this method are discussed elsewhere (Upcraft and Wortman, 2000). Given that many potentially data-rich participants were training or competing overseas at the time of the data collection, rendering interviews problematic, this electronic survey method represented the most fruitful approach. In addition, given the aims of the research, there was no reason to suspect that responses would be any less reliable than would have been the case with interviews. On the basis that the study required data-rich responses, it was judged that unless participants were sufficiently interested and willing to provide an appropriately considered answer, a large quantity of low quality data would result. Consequently, a sampling method described by Fife-Schaw (2000) as snowballing was used. In snowball sampling, a network of participants is self-generating; that is, each participant is asked to suggest the name(s) of other individuals who may be willing to participate in the study.

A brief description of the placebo effect was sent to participants: This described the effect as

"…a positive outcome resulting purely from a person's belief that they have received some beneficial treatment when in fact they have received a 'sham' or 'fake'. The placebo effect is well documented in medicine, where it is used systematically in researching new drugs and sporadically to treat a range of conditions. Experimental research has also demonstrated that the placebo effect may influence sports and exercise performance. For example, athletes who believed they had been given anabolic steroids over a period of time experienced greater

strength gains than athletes who were told they had not received any steroids. This was despite the fact that both groups of athletes received the same inactive substance. Similarly, athletes using a fake respiratory training device experienced similar improvements in performance to those using the real device, and cyclists who believed they had received a performance enhancing substance performed to a higher level in time trials than when they believed they had not".

After reading the above, participants were asked to respond to two questions: 1) 'Do you believe that your performance could be influenced by the placebo effect or by similar false beliefs?' and 2) 'Have you ever experienced a moment in sport in which a false belief affected your performance?'

Analysis

Data derived from Question 1 above were classified as 'yes' or 'no'. Data derived from Question 2 were analysed using inductive content analysis (for an overview of this procedure see Jackson, 1995). Data were content-analysed in two distinct stages. The first stage was to identify raw data items directly related to placebo effects and to separate these from un-related responses. The second stage was to group together raw data items with similar meaning into higher order themes.

Results

Requests for information were sent via email to 16 potential participants. This number rose to 48 through use of the snowball sampling method described above. 30 replies were received. Participants' responses to any one category are represented in parenthesis as a percentage, firstly as a percentage of total respondents and secondly as a percentage of total recipients.

The potential for placebo effects to influence performance

Twenty-nine respondents (97% of respondents, 60% of recipients) indicated that they believed that the placebo effect could influence their performance. Several respondents expanded on this and offered potential mechanisms (below). The single respondent who indicated a negative response did not propose any specific reason for his belief.

Athlete's experience of placebo effects

Twenty-two respondents (73%/46%) were able to recall an event in which some form of placebo effect or false belief had positively influenced their performance. Inductive content analysis revealed that these fell into four categories; 1) explicit placebo effects, that is effects resulting from a false belief deliberately propagated by a third party; 2) inadvertent false belief, that is an effect resulting from accidental misinformation either by a third party or by the athlete themselves; 3) ritual, that is, effects related to the customary behaviours of an individual or a sport; and 4) reverse placebo effects, that is the realisation that a substance or technique now discontinued was in fact exerting its influence via a placebo effect.

Explicit placebo effects Two athletes (7%/4%) reported placebo effects resulting from a false belief deliberately propagated by a third party. For example, a first year professional cyclist reported:

"I was in the bunch and was told to get some food for the team leader with another guy. On our way back to the support car I said 'man my legs are [colloquialism for 'tired'] and there is no way I can get back [to the lead group]. He gave me two white pills and he said after 20 minutes you will feel a million dollars. Sure enough I started to have no pain in my legs and back and this is after a week of already racing. I felt like I was really on form and had loads of power, the rest of that stage was not a problem. The second from last stage was a time trial and again I thought I was in trouble. I went to the guy and asked if I could have a couple more of the magic pills and he gave me two of the same again. I rocked the stage and people were talking about me, after taking second in the stage".

Subsequently the cyclist, having finished second on the penultimate stage, faced a doping control. He went to the team mate and asked what the tablets were. He was told they were sugar pills, and it was evident that this was a 'trick' that had been pulled on new team members a few times in the past. The doping control was negative. The respondent went on to describe his concern that he might have taken an illegal substance and his subsequent realisation, on being informed that he had not (a state of affairs arguably validated by the negative results of his doping control) that he had been able to ride far harder than he believed, possibly purely based on his *belief* that he had ingested a performance enhancing substance: "I had been tricked and thought I was using a banned substance and the fact was that I was not. I had been given a sugar tablet, but I found that I was able to push myself a lot harder and ride for longer."

Performance effects based on inadvertent false beliefs 10 respondents (33%/19%) reported that they had performed to a higher than anticipated level as a result of inadvertent false information, either from a third party or from their own mistaken perceptions. A decathlete reported "I lifted a personal best on the bench-press, when I thought I was actually lifting 10kg lighter. Maybe not the placebo effect, but certainly a case where a "limiting belief" was put aside by accidentally fooling myself!".

Ritual Placebo effects based on ritual were reported by three respondents (10%/6%). For example, a triathlete recalled:

"I guess the most recent and conscious example of the placebo that I have is the rather dubious habit we triathletes have of shaving our legs. To be honest with you I shave my legs for a completely psychological advantage, and I'm happy to admit it. This year I distinctly remember the effect because I had taken some 1500m swim times a few days before and so was very much aware of my swim form at that very point in the season. I jumped in and was immediately struck by my new found streamlined sensation as I was cruising through the water, I vividly remember feeling sleek, efficient, 'clean', and when I finished that day I found that I had taken 38 seconds off my previous time. A few days later when did another 1500m time trial I was only 10 seconds faster than my 'with hairy legs' time. Placebo? I believe so…".

Reverse placebo effects Reverse placebo effects, that is, an improvement in performance associated with a substance or intervention that was sustained even after discontinuation of that substance, were reported by five respondents (17%/10%). An ex-professional rugby player stated:

"I could list all sorts of training methods that I believed improved my performance but in retrospect make me laugh. I believed Deep Heat was essential preparation for the muscles prior to intense exercise. When I found it wasn't and stopped using it, unsurprisingly my performance and flexibility did not diminish (!)".

Athletes' opinions as to the mechanisms underlying placebo effects

10 respondents (33%/19%) also speculated as to the mechanisms underlying placebo effects in sport. These fell into five categories which were labelled 1) expectancy; 2) faith in a third party; 3) marketing; 4) change in behaviour and 5) random fluctuation. Several respondents cited more than one mechanism.

Expectancy Seven respondents (23%/14%) proposed that, in their view, belief in the efficacy of a substance or item of equipment is likely to influence its effects on performance; for example "Yes, to a degree I think my performance could be enhanced if I were under the impression I was taking something or receiving treatment to improve performance"; "If someone believes that something will enhance their performance there is a good chance that it will" and "I strongly think that when we are taking any type of supplement or medication that our mind convinces us that the product will work". This was expanded upon by a respondent who suggested:

"…the issue to me is really whether you believe that what you are taking will be advantageous to performance or not. If you believe it will, regardless of physiological impact - so long as it is not deleterious to physiological ability - performance will improve".

Faith in a third party Five respondents (16%/10%) speculated that the coach athlete relationship was critical to the placebo effect, for example:

"I believe all human endeavors could be manipulated by the placebo effect if the recipient (of the placebo) believed it to be true. Given that most placebo's would be administered by a third party (coach, doctor, physiologist etc.) it might well be the athlete / third party relationship that would determine the success or failure of any supplement especially if it was a placebo. If the athlete has total unconditional trust and respect for the third party and is told "take this – you will go faster" it is more likely to work given the psychological bond in the relationship".

Similarly, another suggested:

"I am sure that if I was told by [my coach] that should I drink XYZ before training that it would help with my performance, I am sure that what would really happen is that I would try harder and achieve a better result believing that this liquid had helped me".

Marketing The role of marketing in placebo effects was also alluded to by two participants (7%/4%), for example "…I believe that there are many products that are appealing to many people looking for short-cuts to fitness that do not have any scientific benefit but still work", and:

"Squash racket design technology has evolved significantly from the early 80's with the use of carbon fibre and graphite materials. Whenever a new design concept came out, the manufacturer (or sponsor) would encourage you to use the latest equipment to improve your performance. One year it was more strings closer together, the next it was less strings spaced further apart, the next year it was a different shaped frame. Whatever racket you used and you believed in it you could play better. If you went back to a 'old' design you were still able to play well".

Change in behaviour Three respondents (10%/6%) argued that the placebo effect was the result of a change in behaviour. For example "…I would probably try harder and achieve a better result believing that this liquid had helped me", and "…I am not certain of how much this is due to the supplement or to the fact that subconsciously I am training harder".

Random fluctuation in performance One respondent (3%/2%) suggested that any change in performance associated with a purported placebo effect might in fact be the result of other mechanisms, suggesting "…this 'stronger' feeling could be attributed to better preparation and more rest."

Discussion

Data suggest that the majority of respondents believed that the placebo effect could exert an influence on sports performance. Furthermore, 73% of respondents reported experiencing performance effects driven by some form of false belief. Data hint at the often strong relationship between belief and performance, specifically, that an athlete's belief in a substance, a piece of equipment, a technique or even another person, might be a significant factor in their subsequent success.

Defining the placebo effect can be problematic. It is clear from the above data that several respondents are aware that a false belief might enhance performance via a conscious decision-making process as opposed to any direct somatic or psychological mechanism. Three respondents made an explicit link between false belief and a subsequent deliberate change in behaviour, for example, a distance runner suggested "I am sure that what would really happen is that I would try harder and achieve a better result believing that this liquid had helped me". It could be argued that, having been driven by a false belief, such an improvement in performance is legitimately classified as a placebo effect. Conversely however, it could be argued that, having been driven by a conscious decision, such an improvement in performance is simply the result of modified strategy. It is not the intention of this paper to define the placebo effect. It suffices to say however that the problem lends support to the suggestion above that observed experimental effects should be triangulated with testimony from participants. Such an approach would help to ensure that an effect that appears to have been driven directly by an experimental manipulation might not simply be the result of a change in strategy by the participant, or just as importantly, vice-versa.

Table 1. Potential for the two- and three-condition experimental design to detect relationships between placebo and experimental conditions, and true baseline values.

Likely outcome	2 condition design	3 condition design
(a) Exp > Pla	Yes	Yes
(b) Exp = Pla	Yes	Yes
(c) Pla > Exp	Yes	Yes
(d) Exp = Pla = Bas	No	Yes
(e) Exp > (Pla = Bas)	No	Yes
(f) (Exp = Pla) > Bas	No	Yes
(g) Exp > Pla > Bas	No	Yes
(h) Pla > (Exp = Bas)	No	Yes
(i) Pla > Exp > Bas	No	Yes
(j) Exp > (Bas > Pla)	No	Yes

Abreviations: Bas = Baseline level; Pla = Placebo condition; Exp = experimental condition. The symbol '=' indicates no significant differences between; the symbol '>' indicates that the condition to the left was associated with significantly better performance than the condition to the right.

The fact that athletes recognise the potential for false beliefs to impact on performance should be of interest – if not of concern – to all sports scientists. Although not specifically relating to the research questions and thus not included in the analysis above, the testimony of one athlete, a current World Champion, was compelling. He started by speculating that his use of nutritional supplements and his willingness to adopt almost any technical innovation might have amounted to a placebo effect, but concluded:

> "Does that mean that all those supplements and hours spent worrying about small equipment enhancements didn't matter. No, I think they mattered a great deal because they gave me a mental 'edge', and standing at the start line with that edge was more important than anything, because it gave me those few extra metres in the first minutes of the race…".

Implicit in the statement is the idea that although the nutritional aids and equipment might have made no difference nutritionally or mechanically, they impacted on his performance positively and significantly, perhaps in a way similar to the energy patches described above. It might be reasonably construed from this athlete's testimony that, had he participated in a hypothetical quasi-experimental study that deprived him of a habitually used nutritional supplement or item of equipment prior to an event, he might have underperformed in that event. Clearly, such beliefs could be described as superstitions, and on that basis, a sport psychologist might encourage the athlete to progressively reduce his faith in them. However, perhaps one of the most intriguing aspects of the placebo effect is the possibility that it *interacts* with biological/mechanical factors to augment their respective action (or possibly, in the case of the nocebo effect, to limit those actions), as opposed to working in isolation in the absence of any real biological/mechanical effect. In such a case, any attempt to lessen the athlete's faith in a specific biological/mechanical factor might also reduce its eventual contribution to performance.

The data reported above do not provide conclusive evidence that the placebo effect influences sports performance. Like Vogt's (1999), they are anecdotal and based on perception and recall, two all too frequently unreliable processes. In many instances, alternative explanations for many of the accounts above could be proposed. For example, the 'reverse placebo effect' described above, that is as an improvement in performance associated with a substance or intervention that was sustained even after discontinuation of that substance, is perhaps far more readily explained as the result of the athlete in question incorrectly attributing performance-enhancing qualities to the substance in the first place. It is also possible that respondents were influenced by a desire to tell the researcher 'what he wanted to hear', or a desire to account for events via esoteric mechanisms rather than by looking for more simple explanations, such as a training effects or random biological fluctuation. However, one aim of the present paper was to ascertain the type of phenomena athletes themselves describe as placebo effects, and to that end such perceptions warrant dissemination.

The sampling method employed, snowballing, is designed to allow researchers access to potentially data-rich respondents. However, it also introduces considerable response bias from a number of perspectives, foremost of which is the potential for a self-selected sample. It is possible that recipients who have not experienced the placebo effect or who have either a negative or neutral opinion would not respond (for example, only one of 30 respondents above reported such a negative/neutral attitude, which struck the author as being a suspiciously low figure). However, it was not the aim of the present study to quantify factors such as the frequency with which placebo effects occur in a population, and consequently no attempt is made to generalise the findings or to categorise them either by sport, gender or age (clearly the relatively low number of respondents and wide variety of sports would preclude such a quantitative analysis).

Overall, when experiential data above are considered alongside respondents' theories as to the mechanisms underlying placebo effects, and the empirical and anecdotal evidence reported above, there is a case for arguing that the placebo effect might be a significant factor in both sports performance research and competition, and that consequently research into the nature, magnitude and antecedents of this effect is warranted.

Elucidating the placebo effect in experimental research

Although perhaps a little unconventional in a discussion, it seems that, having arrived at the conclusion above, some brief mention of how greater insight into the placebo effect might be achieved is warranted. The potential outcomes of an experimental intervention study are presented in Table 1. Referring to Table 1, when an experimental intervention results in improved performance over placebo condition (a, e, g), the efficacy of the intervention can be demonstrated using both 2- and 3-condition designs. Use of the 2-condition design however precludes evaluation of whether the performance in the placebo condition was equal to baseline (e), more effective than baseline (g), or less effective than baseline (i). The concept of the placebo control assumes that the placebo condition is associated with improved performance over baseline. This assumption might be flawed; in two recent studies into caffeine and cycling performance (Beedie et al., 2006; Beedie & Foad, 2006) the performance of certain participants in the placebo condition was consistently *slower* than their baseline performances, suggesting that even if an experimental intervention is found to be significantly more effective than a placebo control, it might in fact be no more effective than true baseline.

Depending on the aims or hypotheses of the study, this might not be significant. However, more seriously, if a 2-condition design is adopted and *no* significant differences are observed between experimental and placebo conditions (b, d and f), in a well controlled study the only conclusion that can be drawn is that the intervention was unsuccessful. However, given the same outcome, using the 3-condition design it is possible to ascertain whether placebo and experimental conditions did not differ from true baseline (d), in which case the intervention was indeed ineffective, or whether both placebo and experimental conditions resulted in similarly improved performances over baseline (f), suggesting that the intervention was successful, but that it has a significant psychological component. This is a somewhat different conclusion to 'on the basis that the intervention did not perform better than placebo control it was deemed unsuccessful'. In masking any placebo effects, the 2-condition design does not reflect the true mechanisms underlying enhanced performance in the real world, and it is the real world, not the laboratory, that is of ultimate interest to sports science.

Conclusion

Data reported above suggests that athletes experience the placebo effect in competitive situations. It is suggested that researchers in sport seek to investigate the impact of the placebo effect on performance via the use of no-placebo control conditions alongside placebo and experimental conditions in experimental research. Such research would perhaps help elucidate the placebo effect, rather than simply controlling for it as has historically been the case.

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Key points

- A survey of 30 athletes revealed that 73% have experienced a placebo effect in sport.
- Athletes suggest several potential explanations for these effects.
- Findings support the idea that placebo effects might be common in sport.
- Researchers and practitioners should be aware of the possible impact of these effects on research findings and competitive performance.

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