“Because I know It will!”: Placebo Effects of an Ergogenic Aid on Athletic Performance

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In the perpetual quest for better performance, athletes are using an increasingly diverse range of ergogenic aids. Some are permitted; however, this “drug” use is often seen as an ethically questionable behavior. A variety of research suggests that much of the impact of such aids may be due to expectancy—the belief that the substance will aid performance. It would be useful to demonstrate this to athletes considering such usage, especially as a pillar of antidrug education. Accordingly, this investigation used sodium bicarbonate and placebo additives in a double dissociation design, with athletes completing a series of 1,000-m time trials. Results showed that believing one had taken the substance resulted in times almost as fast as those associated with consuming the drug itself. In contrast, taking the drug without knowledge yielded no significant performance increment. Results are discussed against the backdrop of applying expectancy effects in high-performance sport, including dissuading athletes from using illegal aids.

Key Words: placebo response, expectancy effects, double dissociation

In sport today, anecdotal evidence suggests that athletes are using more performance-enhancing drugs in an attempt to find that “edge” over their competitors (Yesalis, 2004). However, how much of this edge can we attribute to the pharmacological properties of the drug or can the benefit be ascribed, at least in part, to the well-documented impact of expectancy?

Although the two are not the same (Beecher, 1961), the role of expectancy has been closely linked to research on placebos, and is now assumed to play a mechanistic role in the placebo effect (Kirsch, 1985). Wolf (1959) defined a placebo effect as “... any effect attributable to a pill, potion, or procedure, but not to its pharmacologic or specific properties.” Expectancy effects alone are related directly to the individual’s beliefs regarding the efficacy and effect of the administered substance and, as such, arguably play the major role in the effects that are generated by (what should be) a chemically inert placebo.
The role of placebos and expectancy has been documented in many fields of research, including alcohol, surgery, postoperative pain, dental pain, and asthma (Abrams, Kushner, Medina, & Voight, 2001; Lasagna, Mosteller, Felsinger, Henry, & Beecher, 1954; Levine, Gordon & Fields, 1978; Levy & Earleywine, 2003). Most of this research stems from work carried out on placebo effects, and thus a causal relation between expectancy and placebo, as described previously, has been assumed (Kirsch, 1985). For example, a landmark study by Beecher (1961) showed that 30–40% of patients who were given a placebo for various ailments experienced relief when that substance was presented to them as a potentially efficacious intervention. As such, manipulation of expectancy alone would appear to hold some potential as an intervention in and of itself, quite apart from the as-yet unquantified contribution it may make in association with an “active” substance.

The capacity for the mind to affect the body has enormous ramifications, especially in sport; indeed, this premise arguably underpins the discipline of sport psychology. Research has already shown expectancy to play a major part in the success of treatments within the field of performance and sport. For example, investigating the effect of a placebo (presented as caffeine) on motor performance (e.g., Kirsch & Weixel, 1988) found that results were dependent upon the persons’ beliefs in the efficacy of that substance. Those individuals who expected the substance to impede performance showed a drop and those expecting enhancement showed an improvement. Performance improvements were also seen with weight lifters and saccharin, when this chemically inert substance was presented as an anabolic steroid (Maganaris, Collins, & Sharp, 2000). Interestingly, when the deception was revealed, participants’ performance decreased; in many cases, back to the same levels as before the intervention, even though they had personal and “unaided” experience of the higher weights.

So expectancy effects work in sport, just as in other spheres of human challenge. At present, however, there is a paucity of research available relating to the exact contribution of expectancy to performance. Thus, although several researchers have demonstrated the placebo effect (Abrams, Kushner, Medina, & Voight, 2001; Kirsch & Weixel, 1988; Lasagna et al., 1954; Levine, Gordon, & Fields, 1978; Levy & Earleywine, 2003; Maganaris, Collins, & Sharp, 2000), there are no studies that have independently evaluated the pharmacological versus the expectancy contribution of performance-enhancing aids. Accordingly, this study was designed to investigate the expectancy versus actual impact of receiving an ergogenic aid on performance and perceived exertion with highly trained endurance athletes.

The treatment chosen was sodium bicarbonate (NaCOH$_3$). This substance has been shown to affect both performance and rating of perceived exertion (RPE) in endurance-based activities (Bird, Wiles, & Robbins, 1995; McNaughton 1992; Robertson et al., 1986; Swank & Robertson, 1989). Crucially for our purpose, sodium bicarbonate is also well known “on the street” as a potential enhancer of performance, although (also crucially for the purposes of this study) it is not banned by the International Olympic Committee (IOC) or the International Association Athlete Federation (IAAF). Although the exact mechanism for the improvement is still being debated (McNaughton, 1992), sodium bicarbonate is reported to operate as a hydrogen ion “buffer.” The normal resting pH of arterial blood is 7.4, whereas the pH of venous blood and interstitial fluids is around 7.35. A person is considered to have acidosis if the pH falls below 7.4 and alkalosis when it rises...
above this level. Sodium bicarbonate is an alkaline salt found naturally in the body whose main function is to control acid–base balance. During high-intensity exercise, H+ ions accumulate and upset the acid–base balance, resulting in pH levels falling below 7.4 and acidosis occurring. Fatigue is thought, in part, to be due to an increase in intracellular H+ ions and therefore the administration of a buffering substance before exercise could theoretically delay an increase in H+ by allowing an enhanced efflux of protons and lactate from the muscle, and a greater capacity to buffer the protons in the extracellular fluid. By augmenting extracellular buffering, glycolytic metabolism may be enhanced and therefore anaerobic capacity increased. Sodium bicarbonate has been shown to increase the buffering capacity in the extracellular space. Thus, by ingesting sodium bicarbonate, a person can delay the potential onset of metabolic acidosis (McNaughton, 1992).

In initial research, there were conflicting reports as to the efficacy of sodium bicarbonate as a performance enhancer during short-term maximal exercise (Horswill et al., 1988; Tiryaki & Atterbom, 1995). However, it is now accepted that ingesting sodium bicarbonate at a rate of 0.3 g/kg body mass, approximately 90 min before the event, can improve performances in maximal effort trials of between 120 and 420 s (Osnes & Hermansen, 1972; Linderman & Fahey, 1991; McNaughton, 1992; Bird et al., 1995).

Therefore, this study was designed to delineate the performance contribution made by expectancy alone compared with the performance-enhancing effects of sodium bicarbonate on a 1,000-m running time trial. Based on previous literature, we hypothesized that athletes who received sodium bicarbonate would improve their performance times and report a lower RPE during their trials. In addition, and also reflecting previous literature, we hypothesized that the expectation of receiving sodium bicarbonate would also result in improvements in performance and a reduction in RPE. Specifically, however, we were most interested in the difference between these conditions, in order to evaluate the relative contributions of actual consumption (the pharmacological impact) against expectancy, the belief that one had consumed the drug. Accordingly, a four-cell Latin square design was employed, permitting within-subject comparisons under all permutations of drug taken (active/placebo) and information given (assumed received/assumed not received). The within-subject design also allowed us to control for environmental and other potential confounds between different testing sessions.

Method

Participants

Sixteen endurance athletes (12 men and 4 women, mean age = 24, SD = 3, range = 17–32 years) were recruited for the study. All athletes had attained national age-group entry standards during previous club competitions within the last 12 months. Recruited through advertisement, all volunteered to participate and completed informed consent prior to starting participation in the study. The study was given ethical clearance through the University of Edinburgh ethics committee. The specific criteria used for inclusion are as follows:
• Minimum age of 17
• Trained endurance athletes (defined as persons who train at least 5 days per week, including two high-intensity sessions)
• Able to complete four high-intensity trials within a 2-week period
• Obtained national age-group entry standards within the previous year
• Experienced lactic acid accumulation
• Not previously experimented with sodium bicarbonate
• Passed a health questionnaire

Design

As noted previously, a four-cell Latin square research design was used. In this design, the 16 participants completed all four experimental conditions. The four experimental conditions were as follows:

1. **Told Drug/Given Drug** (DD)—participants were told they would receive the drug and actually did.
2. **Told Drug/Given No Drug** (DN)—told they would receive the drug but actually did not; this was the *placebo* condition.
3. **Told No Drug/Given Drug** (ND)—told they would not get the drug, but actually received it in disguised form.
4. **Told No Drug/Given No Drug** (NN)—told they would not receive the drug and did not.

This deceptive administration method was chosen over the common double-blind procedure, as research had shown the double-blind procedure not to be an appropriate method by which to calculate drug effects (Kirsch & Weixel, 1988).

A within-participant design was employed, using a Latin square formation to detect and if necessary control for any order effects. Each of the 16 participants was randomly assigned to one of four groups, and condition order was balanced across these groups using the Latin square design. Each participant ran his or her trial individually to limit the potential of competition between individuals and any related influence. Trials were run with a minimum of 6 days of rest between each, and were carried out at the same time and venue on each occasion. A balanced placebo design was used. This yielded a $2 \times 2$ matrix: $2$ (told drug/no drug) $\times$ $2$ (received drug/no drug) making up the four conditions mentioned earlier. This design had been shown to obtain the most effective results for drug effect, expectancy effect, and their interactions (Marlatt & Roshensaw, 1980).

Conditions Told Drug/Given Drug (DD) and Told Drug/Given No Drug (DN) permitted comparison of the pharmacological and psychological effects against those of expectancy alone. Conditions Told Drug/Given Drug (DD) and Told No Drug/Given Drug (ND) then provided an evaluation of purely pharmacological effects. Finally, comparison of conditions Told Drug/Given No Drug (DN) and Told No Drug/Given No Drug (NN) allowed an evaluation of expectancy effects in the absence of any pharmacological influence.
Materials

All instrumentation and procedures were developed through substantial pilot testing with athletes of the same characteristics as the investigative group. For brevity, these details are not fully covered in this article, although further details are available on request. In summary, this pilot work provided drinks that were of similar taste, were equally palatable, and that enabled the administration of sufficient active substance without side effects that would have inhibited the athletes’ performances.

**Drink Solutions.** In the active substance, the solutions were a mixture of sodium bicarbonate and lemon cordial. Lemon cordial with a pinch of salt was used for the placebo conditions. All solutions were administered in a 750-mL water bottle, and the amount of sodium bicarbonate used (where appropriate) was calculated as 0.3 g/kg of body mass. Participants were allowed to drink water ad libitum in addition to the solution given.

**Information Leaflet.** An information leaflet on sodium bicarbonate was given to all participants at the start of the study. Content was determined from a survey carried out previously on the participants, in which they had been asked to list their main questions and concerns regarding sodium bicarbonate. The top six topics were then used to form a question/answer information sheet, which ensured that all participants began the study with a similar degree of knowledge about the drug. Through this medium, we hoped to reduce the potential for knowledge, or lack thereof, being an extraneous variable.

**Manipulation Scripts.** This study involved deception on the part of the researcher; therefore, a standardized script was used to prevent any experimenter bias. Participants were under the assumption that they were testing a new performance-enhancing aid that included a combination of sodium bicarbonate plus an additive. The additive was designed to mitigate against the “bad” effects known to exist with this sodium bicarbonate, namely, gastric bloating, discomfort, and stomach upset.

![Figure 1](#)

<table>
<thead>
<tr>
<th>GIVEN</th>
<th>Received NaCOH₃</th>
<th>Received Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOLD</strong></td>
<td><strong>Told Drug</strong></td>
<td><strong>Active drug alone</strong></td>
</tr>
<tr>
<td><em>NaCOH₃</em></td>
<td><em>Told Drug/ Given Drug (DD)</em></td>
<td><em>Active plus additive</em></td>
</tr>
<tr>
<td><strong>Told No Drug</strong></td>
<td><strong>Double additive dose</strong></td>
<td><strong>Single additive dose</strong></td>
</tr>
<tr>
<td><em>Told No Drug/ Given Drug (ND)</em></td>
<td><em>Told No Drug/ Given No Drug (ND)</em></td>
<td><em>Told No Drug/ Given No Drug (NN)</em></td>
</tr>
</tbody>
</table>

**Figure 1** — Study design. Note that the terms in italics were those used with participants to disguise the nature of the investigation. Those in bold are used in this article, and represent the investigative condition and actual substances taken.
Participants were advised that, in order to fully investigate the individual and combined effects of sodium bicarbonate and the additive, they would experience a different combination of the aid in each of the four trials. All were supplied with a written expectancy script when given the drink, which informed them (truthfully or deceptively) what combination they had been given. The script was then read again to them by the researcher immediately before the trial. This was actually done to investigate the pharmacological and expectancy effects of sodium bicarbonate independently. These scripts also provided an explanation of any minor differences in taste between the solutions. The written scripts were as follows. As in Figure 1, the italicized labels were the ones used with participants. The boldface labels reflect the true experimental conditions of each.

**Active Drug Alone (DD):** “In this trial, you will perform with the benefits of Sodium Bicarbonate on its own. As you will recall, this active substance will enhance your performance and limit the pain/discomfort associated with lactic acid build-up. However, you may also experience some of the previously detected side effects associated with this drug, including upset stomach, wind and slight cramps.”

**Active plus Additive (DN):** “In this trial you will be given the combined drug with both sodium bicarbonate and the additive. As you will recall, this active substance will enhance your performance and limit the pain/discomfort associated with lactic acid build-up. In addition to this because you are also being administered the additive you should not experience any side effects.”

**Single Additive Dose (NN):** “As you are aware, we are testing the effects of Sodium Bicarbonate combined with an additive substance. As part of the experimental process we have to determine whether the additive, by itself, has any performance enhancing/debilitating effects. Therefore, for this trial, you will be administered the additive on its own. This means that you should not expect to benefit from effects of sodium bicarbonate or experience any of the detected side effects. To help validate the results relating to the additive, it will be given to you on two separate occasions, this condition has a single dose of the additive therefore, it may differ in taste to the double dose you receive in another condition.”

**Double Additive Dose (ND):** “As you are aware, we are testing the effects of Sodium Bicarbonate combined with an additive substance. As part of the experimental process we have to determine whether the additive, by itself, has any performance enhancing/debilitating effects. Therefore, for this trial, you will be administered the additive on its own. This means that you should not expect to benefit from effects of sodium bicarbonate or experience any of the detected side effects. To help validate the results relating to the additive, it will be given to you on two separate occasions, this condition has a double dose of the additive and therefore may differ in taste from the single dose you receive in another condition.”

**Instrumentation**

**Rating of Perceived Exertion.** A rating of perceived exertion after each trial was recorded using the Borg Category-Ratio (CR-10) Scale (Noble & Robertson, 1996). This scale has been shown to be more effective than the more conventional category-ratio (CR-15) scale when measuring lactate accumulation. The category-
The CR-15 scale is not always deemed appropriate for studies involving the sensation of lactate accumulation because lactate does not rise in a linear fashion. A scale devised to rise in a fashion similar to that of lactate was required. The new CR-10 scale proved to be such a scale and an efficient means of monitoring sensations associated with lactate production. The administration of the scale is standardized and simplified with the aid of an RPE script. The script explains how to interpret and use the CR-10 scale. The content of this script was constructed using six points by Marsh and Noble (1984) which, if satisfied, offer adequate pretest or preexercise instruction for RPE measurements. These points included information on defining perceived exertion, how to relate the anchors to sensations, how to select a relevant number, and the difference between differential and overall ratings, and they explain that there are no right or wrong answers.

**Polar Sport Heart Rate Monitor.** Heart rates were recorded using this heart rate monitor, which provided a series of digital values based on an average across 5-s intervals. Results were downloaded onto a laptop using a Polar interface.

**Boehringer Mannheim Accusport Machine.** This apparatus was used to analyze the lactate levels contained in the blood samples. A finger prick of blood was obtained using a Softclix pro lancet, and Roche BM lactate test strips to collect the blood sample. The strip was then loaded into the machine for analysis.

**Procedure**

The test procedure was piloted on three separate occasions with a different group of athletes; these pilot runs were used to perfect the timing of activities. A practice run was also given to all participants before testing to allow familiarization with instruments and timing protocols; however, no data from these trials were used.

Participants were required to run 5 × 1,000-m individual time trials (one practice and then four experimental trials in a Latin square design) on five separate occasions. After the first practice trial, order was crossed and balanced by the Latin square design such that order effects could be detected while potential confounds (e.g., environmental conditions such as wind and rain) were controlled for. All were carried out at a local synthetic running track. A Timex Rush Stopwatch was used to record performance times, which were taken by the first investigator, a trained track official.

Maximum effort between 40 and 420 s is generally recommended for lactic buffering to take place (Linderman & Fahey, 1991), and 1,500 m has been shown to produce the maximal amount of lactic (McNaughton, 1992). However, a distance of 1,000 m was chosen to in an attempt to prevent “pacing,” familiarity, and overracing by athletes.

One week before the first scheduled session, participants were given instructions to record intake and to eat in a similar fashion before each trial. This food diary allowed participants to replicate as much as possible the food content and pattern they had used for the previous tests. They were also instructed not to partake in any high-intensity physical activity 24 hr before testing. Participants were also reminded not to discuss the tests or results with anyone until completion of the entire project. The trial protocol is presented in Table 1.
All participants ran their time trials individually; they were given 30 min to drink the solution, leaving the allocated 90 min period prior to testing. The check-in times of 20 min and 5 min were selected to facilitate experimental control and to match check-in times used during normal competitions. Heart rates were continually recorded at 5-s intervals, during each of the trials. Both lap times and final times were recorded for each trial.

On completion of each trial episode, participants’ preparation schedules were examined. They were also interviewed to confirm their satisfaction with their performance—specifically that, in their own perception, no extraneous circumstances had affected their time trial. No such impediments were reported, and inspection of dietary sheets suggested that preparation schedules were consistent within participant. Finally, participants were questioned about their experiences with the substance ingested, and their perceptions of its impact were solicited. This questioning also tested participants’ expectations of the drug they thought they had received.

Several weeks after the conclusion of the study, all were debriefed individually about their experiences of the investigation. After all pertinent information had been solicited, they were informed about the true nature of the study and debriefed on their own personal performances.
Analysis

Given the completely crossed design, it was important to check that the impact of the various conditions had not been affected by the order in which they were completed. The Latin square analysis was employed as the first level of analysis, and, because this showed no order effect, order was ignored for the remainder of the investigation. We then completed three distinct ANOVA-based analyses on each of the variables of interest, namely, performance (as shown by time), perceptions (as measured by RPE), and the physiological impacts (as measured by blood lactate). Finally, we considered the various manipulations checks and associated data, which enabled a stronger interpretation of the effects observed.

Results

Summary data for all variables, lap and final times, RPE, and blood lactates for the 1,000-m time trials under the four conditions are shown in Table 2.

Performance

Differences in performance were examined by use of a 2 × 2 (Given × Told) ANOVA, with final time as the dependent variable. This analysis demonstrated a significant main effect of Told, \( F(1, 15) = 51.4, p < 0.001, \eta^2 = .774 \). Interestingly, no other effects were significant—neither the main effect of the drug itself Given, \( F(1, 15) = 0.01, p > .05, \eta^2 = .001 \), nor the interaction of Given × Told, \( F(1, 15) = .220, p > .05, \eta^2 = .014 \). For the purposes of this investigation, the key finding is the significant differences in performance associated with being told that one had received the drug, against the lack of significant benefit from actually receiving it.

Perceptions

Table 2 also provides the final RPE descriptive statistics for each condition. A similar 2 × 2 (Given × Told) ANOVA was employed, which yielded very similar results. The main effect of Told was again significant, \( F(1, 15) = 8.3, p < 0.05, \eta^2 = .355 \). As with the performance analysis, no other effects were significant—neither the main effect of the drug itself Given, \( F(1, 15) = 0.01, p > .05, \eta^2 = .001 \), nor the interaction of Given × Told, \( F(1, 15) = 1.8, p > .05, \eta^2 = .107 \). Once again, effects

Table 2  Mean and SD for Performance Times, RPEs, and Blood Lactate Levels

<table>
<thead>
<tr>
<th>Condition</th>
<th>Performance times</th>
<th>RPE average</th>
<th>Blood lactate concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lap time</td>
<td>Final time</td>
<td>Pretrial</td>
</tr>
<tr>
<td>DD</td>
<td>70.6 ± 9.6</td>
<td>184.7 ± 24.1</td>
<td>5.2 ± 1.9</td>
</tr>
<tr>
<td>ND</td>
<td>72.5 ± 9.8</td>
<td>188.5 ± 24.4</td>
<td>5.9 ± 2.6</td>
</tr>
<tr>
<td>DN</td>
<td>72.5 ± 9.8</td>
<td>185.1 ± 22.1</td>
<td>4.8 ± 1.6</td>
</tr>
<tr>
<td>NN</td>
<td>72.0 ± 8.8</td>
<td>187.9 ± 22.4</td>
<td>6.3 ± 2.4</td>
</tr>
</tbody>
</table>

Note. DD = Told Drug/Given Drug; ND = Told No Drug/Given No Drug; DN = Told Drug/Given No Drug; NN = Told No Drug/Given Drug; Lap Time = First 400m of 1000m run.
were as predicted, with participants reporting lower RPEs when they believed themselves to be running “under the influence” of the drug.

**Physiological Effect**

Lactate data were examined by use of a $4 \times 3$ (Condition × Time) ANOVA with repeated measures on both factors. Unsurprisingly, this yielded a significant main effect for Time, $F(2, 30) = 83.0, p < .001, \eta^2 = .847$, but also a significant interaction, $F(6, 90) = 3.59, p < .05, \eta^2 = .193$. Follow-up in all cases of overall significance employed Tukey WSD tests, once again with an alpha level of .05. The substantial increase in lactate concentrations as a result of the run (pretrial significantly lower than post and 5 min post) support the efficacy of the challenge as engendering high levels of effort. In follow-up with the significant interaction, Told Drug/Given Drug (DD) and Told No Drug/Given Drug (ND) produced significantly lower pretrial blood lactates than did the no-drug conditions, suggesting that the bicarbonate had the desired effect, namely, a lowered blood lactate. This would indicate that a state of metabolic alkalosis had been achieved. No other effects reached significance.

**Manipulation Checks**

Finally, the results of the participant questioning and manipulation checks after each trial merit consideration. During the debriefings, 4 of 16 athletes reported a suspicion that the study may have been an investigation of something other than the effect of the new ergogenic aid. However, none of the participants suspected any deception had been used, and all believed that what they had been told was what they received. In fact, several commented on the efficacy of the (chemically inert) “additive,” whereas others complained of the additional gastric bloating they had also experienced from the additive. In short, observation of participant behavior throughout the study and post hoc debriefings supported the efficacy of the manipulation.

**Discussion**

Within the limitations of the study, results support the prediction that expectation of receiving sodium bicarbonate improves performance, without the actual administration of this widely used ergogenic aid. Although the Told Drug/Given Drug (DD) condition produced the fastest time, the condition Told Drug/Given No Drug (DN), which isolated the psychological effect, produced a significantly better average performance than the purely pharmacological impact of the bicarbonate, condition Told No Drug/Given Drug (ND). These findings are consistent with those of Kirsch & Weixel (1988) and Maganaris et al. (2004) and provide further evidence to suggest that expectancy effects alone can generate increases in performance.

Before considering the implications of our results, we should acknowledge the limitations in both the scope and methodology of this investigation. First, the scope, which was focused specifically on delineating the performance contributions of expectancy against a known performance-enhancing aid: Our investigation has made no consideration of exactly how the expectancy effect operates. This delimitation notwithstanding, however, the effects observed are best explained by the mentalistic
theory (Haour, 2005). Although a few placebo effects are due to nonconscious conditioning (Kradin, 2004), the vast majority are due to expectancy. The impacts of this expectancy can be far-reaching, encompassing perceptual, emotional, neurological, and behavioral concomitants, mediated by dopamine and endorphins (Haour; Stewart-Williams, 2004). The exact mechanism of this expectancy effect has not been established, even after continued research using brain imaging examinations. This imaging procedure may eventually produce a mechanistic explanation; however, there seems little doubt from an extensive literature search that the expectancy effect is genuine and far reaching.

Limitations in the methodology also merit attention. The study was designed with an emphasis on “ecological validity,” hence the use of time as the dependent variable from a live run over a set distance. In short, we tested athletes on exactly what they are interested in, namely, their ability to run a set distance in the shortest possible time. This approach involved some potential confounds, including the risks of environmental factors influencing performance. In mitigation, the design did control for such effects through the balanced order of completion, which prevented any systematic impact. We also completed the tests in a period of consistently good weather and checked with participants for any negative impacts on each trial (none were reported). However, the potential for impact of the test environment and the use of a stopwatch by a trained track judge rather than electronic timing must be acknowledged.

These considerations notwithstanding, and within the delimitations of the participant sample, the study has clearly shown that expectancy effects can make a significant contribution to performance. The degree of improvement from a mere “belief” is sizeable, an average of 3.5 s, and could be the difference between a medal and nowhere in major competitions. The evaluation of the magnitude of this expectancy contribution represents the major finding of this study. The power of this effect against the comparative “failure” of the biochemical impact is another important result.

The determining factor here was associated with the athlete’s belief in what they are being told or given; the RPE results clearly support this contention because only the information offered (Told) had any significant impact. In short, athletes were almost looking for effects as a result of the expectancy prime provided, and they apparently paid much more attention to this than the actual messages sent by their muscles! Could this be a learning point for coaches, psychologists, and other support staff regarding their relationships with athletes? The role that a coach may play in enhancing self-confidence in his or her athlete has been acknowledged in the literature (Feltz & Doyle, 1981), but mostly in relation to goal setting. Based on these results, we would highlight the need for coaches and support staff to complete a “hard sell” of their training methods to their athletes, and to check frequently that the performers are completely confident in what they are being asked to do. In short, procedures will enjoy a valuable bonus if the consumers are initially convinced, and remain confident, of their efficacy.

Of course, this research was carried out on subelite athletes, and there are problems with its immediate generalization to elite athletes. Elite athletes have a greater awareness of their bodies and a better knowledge of their limitations than subelite athletes. As such, this particular deception might not work as well with elite athletes as they may be more prepared to hurt themselves and produce a pure maximal effort.
under each condition, especially since the expectancy effect in this study appeared to operate through an increased effort in the (believed) absence of increased pain.

The results also provide a strong argument against taking performance-enhancing drugs. The use of performance enhancing drugs is perceived to have increased over recent years. It has been suggested that only a minority of athletes actually want to use these drugs, but they are seen as tools of the trade and athletes feel pressured to use them in order to “stay in the game” (Yesalis, 2004). Athletes need to be educated that the improved performance associated with taking performance-enhancing drugs may not only be due to the pharmacological properties of the drug. Alternative suggestions and evidence may help to curtail their use within sport. The conception that athletes need to take performance-enhancing drugs to succeed is daunting and needs to be confronted head on. An education process allows athletes to effectively weigh the pros and cons before making decisions. Similar benefits could be gained if they think positively and work on self-belief (Hemery, 1986).

In conclusion, we acknowledge the significant performance benefits gained from ingesting sodium bicarbonate, which have been demonstrated by several published studies. However, the results of this study suggest that some of these well-documented benefits may be gained through psychologically based expectancy effect alone. The significantly lower preperformance lactates obtained in the two active drug conditions, Told Drug/Given Drug (DD) and Told no Drug/Given Drug (ND), suggest that the failure to obtain a significant performance benefit from the drug itself is not due to a poor manipulation on our part. Furthermore, both dose and biochemical responses in this investigation are comparable with other studies. Our results highlight the need for research to evaluate through deception—rather than just control through double-blind procedures—the expectancy effect. We would encourage psychologists to involve themselves in interdisciplinary investigations with physiologists and medical researchers.

References


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