What Did Triplett Really Find? A Contemporary Analysis of the First Experiment in Social Psychology

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What did Triplett really find? A contemporary analysis of the first experiment in social psychology

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In 1898, Norman Triplett published was has been called the first experiment in social psychology and sports psychology. Claiming to demonstrate "the dynamogenic factors in pacemaking and competition," this oft-cited article began the serious investigation of social facilitation. This area of research now numbers in the hundreds of published works, includes the study of humans and other animals, and encompasses basic research and applied settings. But what did Triplett really find? I examine Triplett's original data and show that very little evidence existed for the social facilitation of the simple task he investigated. These analyses indicate the need to correct contemporary accounts of Triplett's work and underscore the differences in how research was evaluated at that time compared with today.

In 1898, Norman Triplett published what has been called the first experiment in social psychology and sports psychology (Aiello & Douthitt, 2001; Allport, 1954; Iso-Ahola & Hatfield, 1986; Weinberg & Gould, 1999), a study widely cited in leading introductory textbooks (e.g., Aronson, Wilson, & Akert, 2002; Brehm, Kassin, & Fein, 1999; Myers, 2001; Sternberg, 2001). The study, Triplett's master's thesis at Indiana University (Davis, Huss, & Becker, 1995), was important in establishing social psychology as an empirical discipline and identifying social facilitation as a phenomenon with far-reaching implications. Indeed, some have gone so far as to claim this publication as "marking the birth of social psychology" (Brehm et al., 1999, p. 12; see also Feldman, 1995; Passer & Smith, 2001).

Based on observation of cycling times in unpaced, paced, and competitive races made available to him by the Racing Board of the League of American Wheelmen, Triplett noted that paced and competitive races seemed to have a facilitative effect on performance. Triplett's evaluation confirmed a view widely shared by cyclists of the time, that riding in competition or with pacers reduced times by 20–30 s per mile. Triplett went on to describe a number of possible explanations, including those

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that are purely aerodynamic ("suction theory" and "shelter theory") and those with a more psychological flavor (encouragement, "brain worry," hypnotic suggestion, and automatic response). Of particular interest to Triplett, however, were what he called "dynamogenic factors":

> This theory of competition holds that the bodily presence of another rider is a stimulus to the racer in arousing the competitive instinct; that another can thus be the means of releasing or freeing nervous energy for him that he cannot of himself release; and, further, that the sight of movement in that other by perhaps suggesting a higher rate of speed, is also an inspiration to greater effort. (p. 516)

Triplett noted that in presenting the cycling records "it is with the feeling that they have almost the force of a scientific experiment" (p. 508), but he correctly noted that limitations prevented clear conclusions:

> Regarding the faster time of the paced races, as derived from the records, it may be asked whether the difference is due to pacing or to the kind of men who take part. . . . The racer finds by experience that race in which he is best fitted to excel and specializes in that. The difference in time, therefore, between the paced and unpaced race, as shown by the records, is a measure of the difference between the experts in the two classes of racers. . . . Ratios between records made by different men, even though they are the product of many riders and entitled to great consideration, have not the absolute certainty that the paced and unpaced time of the same man would have. (pp. 508, 510–511)

Few riders of that era competed in all types of races, however, so the more compelling data were not available. Triplett took the important step of constructing a laboratory experiment to better control the conditions under which paced and unpaced performance could be tested.

Even by today's standards, Triplett's method showed admirable attention to detail. He constructed an apparatus (Figure 1) that allowed the chart-

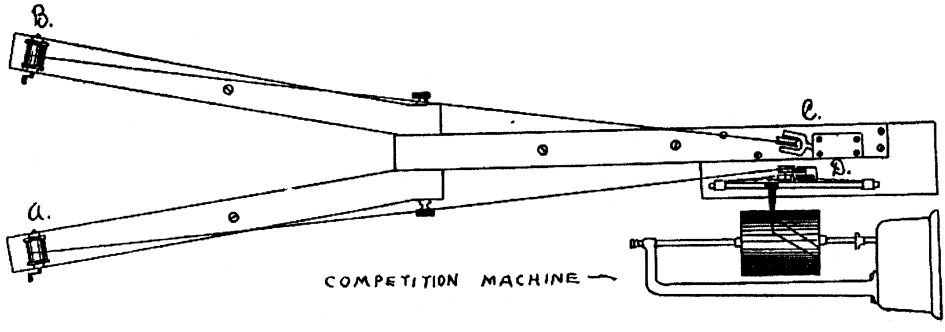

Figure 1. Triplett's "competition machine" (from Triplett, 1898, p. 519)

ing of performance as a person wound a fishing reel, causing a small flag sewn to the silk line to traverse a 4-m course. A performance comprised four circuits of the course, and the time taken to complete a trial was measured by stopwatch. The competition machine was constructed with two reels, allowing a co-actor to perform on some trials. Triplett described in detail the accuracy of the apparatus, claiming that over 10 test trials it took an average of 149.87 turns of the reel to complete four circuits of the course, with a mean variation of only 0.15 turns. He noted that for a typical 40-s trial, 0.15 turns translates into a mere 0.04 s.[1]

Participants in Triplett's study were 40 children (14 boys, 26 girls) ranging in age from 8 to 17 years. Each child practiced "turning the reel until he had become accustomed to the machine" (p. 518) and then participated in six trials, each separated by 5-min intervals to prevent fatigue. The children were divided into two groups. Group A participated in trials in the following sequence: alone, competition, alone, competition, alone, competition. Group B participated in trials in this order: alone, alone, competition, alone, competition, alone. Triplett's rationale for this approach was that

> by this scheme, a trial of either sort, after the first one, by either of the two groups, always corresponds to a different trial by the opposite group. Further, when the subjects of the two groups come to their fourth and sixth trials, an equal amount of practice has been gained by an equal number of trials of the same kind. (p. 520)

Of course, from a contemporary standpoint, the advantage to this design is that both between-group and within-subject comparisons are available, providing a fairly thorough examination of performance differences. At the turn of the 20th century, however, presentation of results did not include the kinds of statistical analyses common today. Instead, results often were tabulated, and occasionally graphed, with patterns of interest highlighted. Triplett divided his sample into three groups based on his evaluation of their performance: those stimulated to faster times on competitive trials ($n = 20$), those inhibited by competition ($n = 10$), and those who seemed to be little affected by competition ($n = 10$). At first blush, the results, though crudely presented, seem to support the overall facilitative effect of competition (Figure 2). In Triplett's words, "from the above facts regarding the laboratory races we infer that the bodily presence of another contestant participating simultaneously in the race serves to liberate latent energy not ordinarily available" (p. 533).

Triplett's work was followed by that of Floyd Allport (1920), who coined the term *social facilitation,* now used as the umbrella description for the research on audience and co-actor effects. Allport also sought to distinguish competition from mere presence effects. A bit later, Dashiell (1930) began

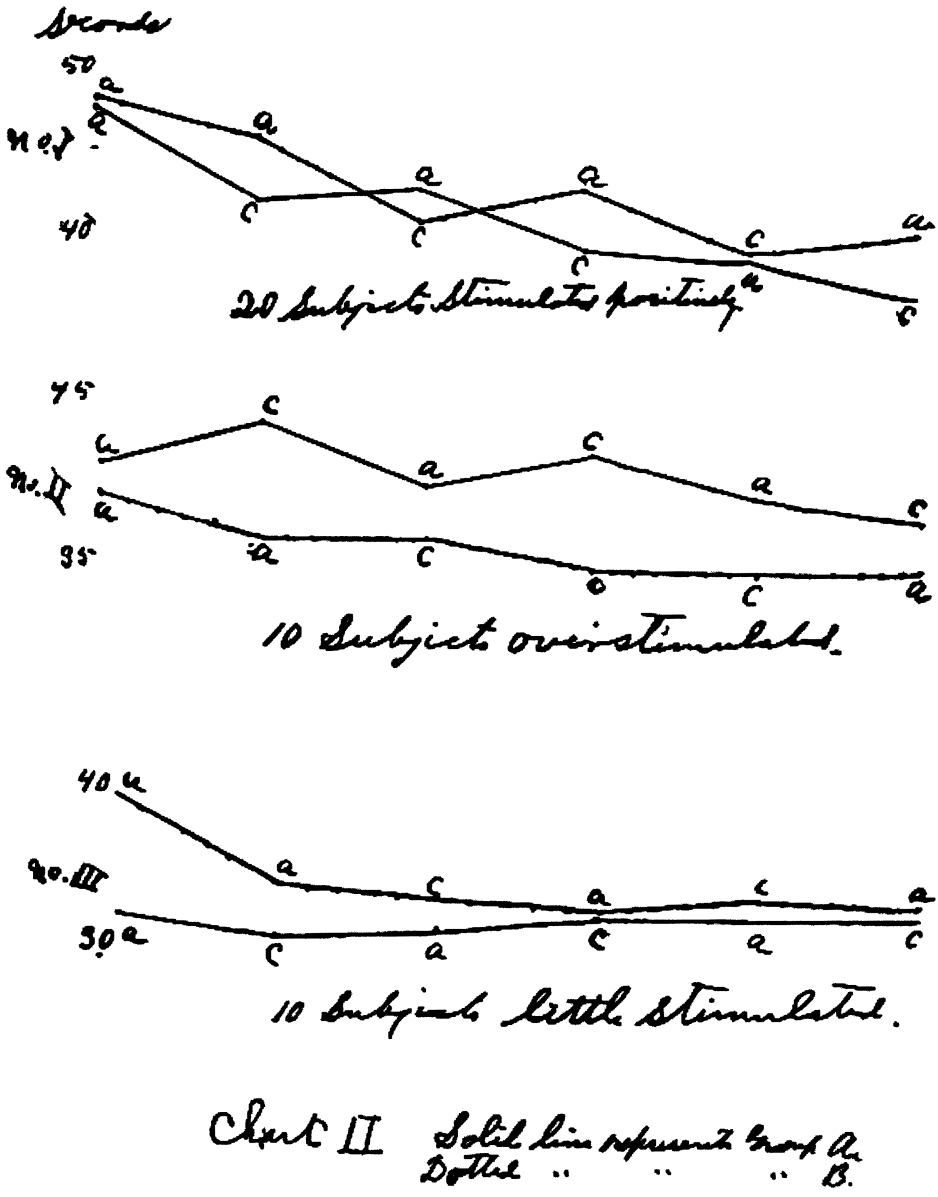

Figure 2. Performance of participants in Triplett's experiment, classified according to those "stimulated positively," those "overstimulated," and those "little stimulated" (from Triplett, 1898, p. 524)

to delineate the different kinds of audiences and co-actors that might affect performance. As others joined these efforts, it became clear that sometimes co-actors and audiences produced facilitation of performance, but sometimes they produced decrements in performance, compared with alone conditions (reminiscent of the overstimulated group in Triplett's study). The conflicting findings set the stage for one of the field's most important syntheses (Zajonc, 1965). Zajonc borrowed from Hull–Spence drive theory (Spence, 1956) to propose that audience presence increases arousal (compared with an alone condition) and makes the dominant response for a task more likely. He argued that task complexity is the key moderator. For simple and well-learned tasks (e.g., Triplett's reel-winding task), for which the correct response was dominant, audience presence should result in better performance. On the other hand, for complex or novel tasks, for which an incorrect response would be dominant, audience presence would be expected to impair performance. Later research further refined the underlying processes at work in these performance settings (Baron, 1986; Baron, Moore, & Sanders, 1978; Cottrell, Wack, Sekerak, & Rittle, 1968; see Aiello & Douthitt, 2001, for a review), pointing to evaluation apprehension, social comparison, and attentional conflict as especially important. Contemporary efforts continue to probe the boundaries and applied significance of social facilitation (Aiello & Douthitt, 2001).

Today, accounts of Triplett's work routinely claim that he found evidence of social facilitation, with some even going so far as to claim that "the children moved the marker significantly faster when competing with a peer than when operating the reel by themselves" (Feldman, 1995, p. 453). Of course, today's accounts undoubtedly do not represent independent assessments of Triplett's work, and those that are may be influenced by the rather biased presentation method that Triplett chose.[2]

What did Triplett really find?

Triplett did not have the advantage of the sophisticated statistical procedures available today, so there was wide latitude for his results to be interpreted loosely by him and later readers. Fortunately, he did publish all the raw data in his article, making possible the application of modern analyses to his classic data set. Those data are presented in the *Appendix* and form the basis for the analyses that follow.

Recall that all participants completed six trials. The first was a performance alone for participants in both order conditions (i.e., Group A and Group B). After that first trial, the two order conditions followed sequences that had participants performing under opposite co-actor circumstances: When one group performed alone, the other performed with a co-actor. The first trial provides a convenient assessment of individual

differences in winding skill and a potential control for those differences in the statistical analyses. Trials 2–6 provide for two basic kinds of comparisons: between groups and within subjects. Triplett also reported the age and sex of his participants, potentially important information to take into account for motor performance among children and adolescents.

Between-group comparisons. Perhaps the simplest approach to the data is to take each trial in turn beyond the first one (which was an alone performance for each order group) and to compare the two groups. For Trials 2–6, when one group performed under alone conditions, the other performed with a co-actor. Three of these tests are especially important. The comparison for Trial 2 is key because it represents a performance comparison uncontaminated by any prior experience with a co-acting peer on the task. The only experience that participants had before this trial was the alone condition of Trial 1. One could argue that after Trial 2, other "alone" performances are not purely performances in isolation and may be tainted by carryover effects from previous competition trials (e.g., whether previous competitions had been "won" or not). Triplett recognized this problem:

> The competitive element entered into the trials alone and it was found advisable in some cases to keep from the subject the time made, as there was a constant desire to beat his own or his friend's records and thus make all the trials competitive. . . . The competition trial was a pattern for after trials, giving a higher ideal of speed and a hint of what was possible for the subject. (p. 530)

In addition, Triplett believed Trials 4 and 6 to be important. As noted before, on those trials, both groups had equivalent numbers of previous trials of each type (alone and competitive).

Figure 3 displays the mean performance as a function of co-actor condition for all trials, including the first. In four of the five comparisons, the performance of participants in the presence of a co-acting peer was faster than the performance of participants winding the reel alone. The differences are quite small, however, and none of them are close to statistically significant, $t(38) = 0.02–0.82$, $p > .42$, $\eta^2 \leq .02$. A multivariate test finds no collective evidence for differences either, multivariate $F(5, 34) = 1.40$, $p = .25$, Wilks's $\lambda = .83$.

It might be argued that the co-actor effects are being obscured by wide individual variation in performance. For example, Trial 1 performance was significantly related to age, $r(38) = -.47$, $p = .002$, and participant sex, boys $M = 37.89$ s, girls $M = 45.47$ s, $t(38) = 2.86$, $p = .007$, $\eta^2 = .18$. Trial 1 performance thus provides a potentially valuable control for individual differences. Analyses of covariance examining performance condition differences while controlling for Trial 1 performance indicated little change

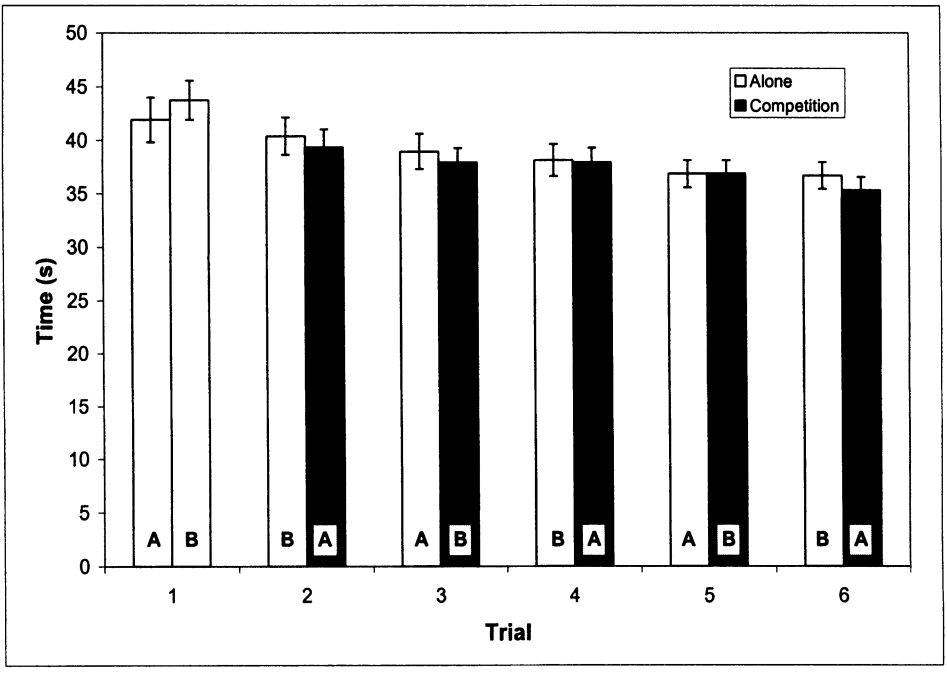

Figure 3. Mean performance (and *SE*) as a function of trial and performance condition (letters indicate order condition)

in conclusions. Trial 1 was a significant covariate, multivariate $F(5, 33) = 34.99$, $p < .001$, $\lambda = .16$; all individual $F(1, 37) \geq 46.06$, $p < .001$, partial $\eta^2 \geq .56$, providing substantial reduction in the error term for testing the performance differences between the order groups. Nonetheless, the performance differences between alone and co-actor conditions remained nonsignificant, multivariate $F(5, 33) = 1.42$, $p = .24$, $\lambda = .82$. The only hint of the predicted difference occurred in Trial 3, for which the univariate test indicated a difference that just exceeded the .05 level, $F(1, 37) = 4.19$, $p = .048$, partial $\eta^2 = .10$. The adjusted means indicated faster performance in the co-actor condition, $M = 37.30$ s, than in the alone condition, $M = 39.53$ s. Of course, using typical standards for controlling the Type I error, this would not be considered a significant effect, and in light of the lack of differences for the other trials (especially the critical Trials 2, 4, and 6) the evidence is hardly convincing. Even from an effect size standpoint, which is unaffected by the small sample size, the basic evidence for social facilitation in Triplett's data is quite thin. Additional analyses indicated that all covariate interactions were not statistically significant, all Fs$(1, 36) \leq 1.72$, $p \geq .20$, partial $\eta^2 \leq .05$, so the relative magnitude of co-actor

effects did not depend on the speed with which participants completed Trial 1.

Within-subject comparisons. An alternative approach to the analyses capitalizes on the potentially more powerful within-subject comparisons. After all, each participant completed both alone and competition trials, and those comparisons might be more revealing. The most general approach is to examine the 5 × 2 (trial × order condition) design in which trial is a repeated measure and order condition is a between-group factor. If there are systematic differences between the alone and competition trials, then this should emerge in the form of a trial × order condition interaction. Specifically, across Trials 2–5, the conditions alternate between alone and competition, in opposite ways for the two order groups. However, the analysis revealed only a main effect for trials, $F(4, 152) = 13.68$, $p < .001$, partial $\eta^2 = .26$, showing the expected better performance on later trials resulting from practice, which is evident in Figure 3. The trial × order condition interaction was not significant, $F(4, 152) = 1.38$, $p = .24$, partial $\eta^2 = .035$.

A more focused comparison was also tested. For each participant, separate averages of performance on alone and co-actor trials were computed (for Trials 2–5). For Group A, the alone trials were Trials 3 and 5, and the co-actor trials were Trials 2, 4, and 6. For Group B, the alone trials were Trials 2, 4, and 6, and the co-actor trials were Trials 3 and 5. Then a simple repeated-measures analysis was conducted, testing the difference between the alone and co-actor means. This test showed that the average of co-actor trials, $M = 37.45$ s, was significantly faster than the performance on alone trials, $M = 38.14$ s, though just barely so, $F(1, 39) = 4.16$, $p = .048$, $\eta^2 = .096$. Thus, when a very specific contrast is used, evidence of social facilitation can be coaxed from the data. Still, it is not especially robust evidence, indicating a mere 1.81% reduction in time when performing with co-actors.[3]

But wait, there's more (or less). With the aid of hindsight and substantial research conducted since Triplett's experiment, we now know that Triplett's task was simple in nature and thus would be expected to show facilitation effects. Yet the task may not have been very simple for two of Triplett's participants. Examination of Triplett's Table I (see *Appendix*) reveals that two of the children were left-handed and so had to use their nonpreferred hands while performing the task. Triplett was also aware of this problem (p. 526) but did not correct for it in any formal way. What happens if these two participants are excluded from the analyses? Figure 4 displays the results with the two left-handed participants excluded; some differences in comparison to Figure 3 are clear. First, Trial 1 differences between the two order groups are smaller in Figure 4. This is important because the only evidence of social facilitation to emerge from the original

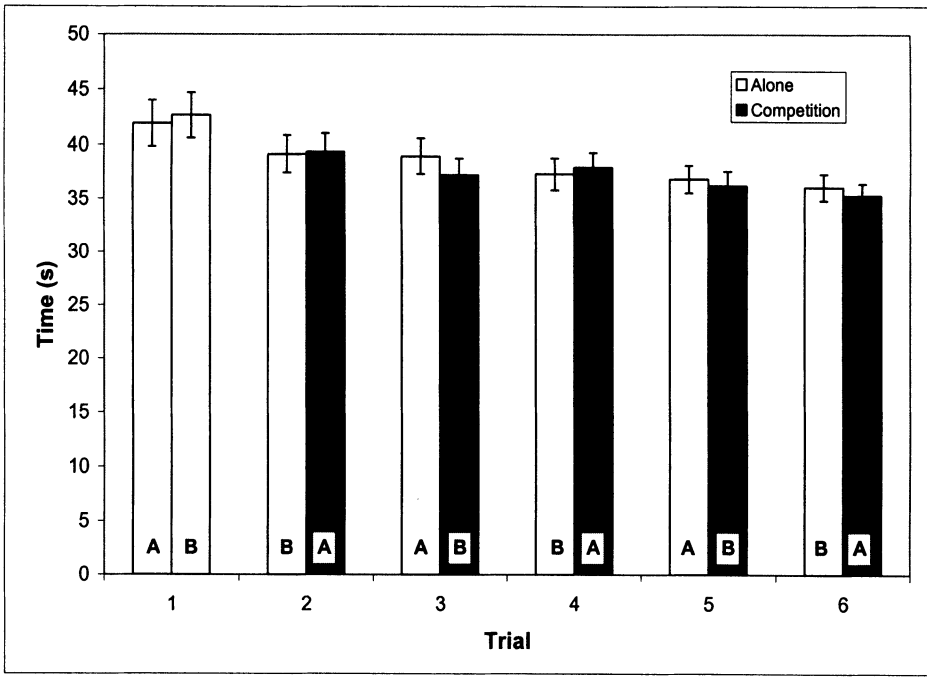

Figure 4. Mean performance (and *SE*) as a function of trial and performance condition with two left-handed participants excluded (letters indicate order condition)

between-group analysis occurred for Trial 3 performance when Trial 1 performance was controlled statistically. Because Trial 1 means are more similar in Figure 4, any covariance adjustment on Trial 3 means would be reduced as well. Second, Trials 2 and 4 show differences in Figure 4 opposite to what would be expected because the slower-than-average times of the two left-handed participants have been removed from the alone condition means. When the analyses reported previously are repeated, excluding the two left-handed participants, all evidence of a social facilitation effect disappears. The simple comparison of order condition groups for each trial fails to show any significant differences, all $t(36) \leq 0.80$, $p \geq .43$, partial $\eta^2 \leq .018$, even when Trial 1 performance is statistically controlled, all $F(1, 35) \leq 3.78$, $p \geq .06$, partial $\eta^2 \leq .098$). Likewise, the specific contrast for the within-subject comparison shows that the alone trials, $M = 37.70$ s, are no longer significantly different from the co-actor trials, $M = 37.14$ s, $F(1, 37) = 2.71$, $p = .11$, $\eta^2 = .068$.

Are Triplett's findings moderated by participant sex or age? These analyses indicate little evidence of social facilitation in Triplett's data. But perhaps the evidence is more complex and dependent on characteristics

of Triplett's sample. He included children as young as 8 and adolescents as old as 17. Both boys and girls were included as well.[4] Indeed, Triplett seemed to think the evidence of competition effects was stronger for girls than for boys (p. 529) and perhaps stronger for younger than for older participants (pp. 526–527). Additional analyses were conducted to test these potential moderators. In one set of analyses, participant sex was included as an additional factor along with order condition in the separate analyses of Trials 2–6. Trial 1 performance was included as a covariate. No evidence of a sex × order condition interaction emerged: Full sample multivariate $F(5, 31) = 2.14$, $p = .087$, $\geq = .74$; univariate $F(1, 35) \leq 1.75$, $p \geq .19$, partial $\eta^2 \leq .048$; reduced sample (excluding the two left-handed participants) multivariate $F(5, 29) = 1.60$, $p = .19$, $\lambda = .78$; univariate $F(1, 33) \leq 1.54$, $p \geq .22$, partial $\eta^2 \leq .044$. An analysis of the focused repeated-measures contrast between alone and co-actor trials, including participant sex as a factor in the design, likewise revealed no evidence of moderation: Full sample $F(1, 38) = 1.28$, $p = .26$, partial $\eta^2 = .033$; reduced sample $F(1, 36) = 1.66$, $p = .20$, partial $\eta^2 = .044$.

A parallel set of analyses examined the moderating influence of age. For the separate analyses of Trials 2–6, no significant age × order condition interactions were found: full sample multivariate $F(5, 31) = 1.37$, $p = .26$, $\lambda = .82$; univariate $F(1, 35) \leq 2.98$, $p \geq .093$, partial $\eta^2 \leq .078$; reduced sample multivariate $F(5, 29) = 1.22$, $p = .32$, $\lambda = .83$; univariate $F(1, 33) \leq 2.17$, $p \geq .15$, partial $\eta^2 \leq .062$. The analysis of the focused repeated-measures contrast likewise indicated no evidence of moderation by age: Full sample $F(1, 38) = 0.07$, $p = .79$, partial $\eta^2 = .002$; reduced sample $F(1, 36) = 0.35$, $p = .56$, partial $\eta^2 = .01$.[5]

Conclusion

The publication of Triplett's experiment in 1898 was a watershed event in the history of social psychology. It marked the formal beginning of the field as an empirical enterprise and launched one of its most enduring and far-reaching research lines. Yet the analyses of Triplett's data reported here indicate barely a statistical hint of the social facilitation of performance to which his experiment has been credited. What do we gain from this exercise? At a minimum, it provides a valuable check on the historical record and, in this case, indicates the need for revision of contemporary accounts. Most descriptions today (e.g., Aronson et al., 2002; Brehm et al., 1999; Myers, 2001; Sternberg, 2001) imply that Triplett found clear evidence of social facilitation, with some making claims suggesting significant differences (e.g., Feldman, 1995). It is now clear that those claims are not warranted. No accounts found to date hedge about Triplett's findings in the way that would usually follow from marginal or nonsignificant statistical results, yet some qualification is clearly needed.

Beyond mere fact-checking, the current analysis highlights how standards for publication have shifted over the past 100 years. Indeed, the analyses presented here certainly make one wonder what would have happened had null hypothesis statistical testing been in fashion in Triplett's day. One can almost imagine the editorial decision letter that would have been sent, undoubtedly praising the quality of the writing, the clarity of the ideas, and the creativity of the design but ultimately declining publication because the results did not meet the magic $p < .05$ level. It seems likely that social facilitation would have been demonstrated eventually, but one wonders how long that demonstration would have been delayed or how many creative minds would have been put off the trail had the significance criterion had such sway then that it has now. It seems likely that a different birthday and originator for experimental social psychology would be celebrated today.

This contemporary analysis of Triplett's data underscores the importance of the debate about the merits of null hypothesis statistical testing and the biases it may introduce into the publication and scientific process (Cohen, 1994; Greenwald, 1975; Hagen, 1998; Hunter, 1997; Krueger, 2001, 2002; Nickerson, 2000; Sterling, 1959; Tullock, 1959; Wainer, 1999). Without taking sides, it should be a reminder that research should be influential beyond the probabilistic certainty of its findings. Indeed, in all other respects, Triplett's study remains an admirable beginning to the field of experimental social psychology. His perceptive observation of a real-world phenomenon (cycling times) to show the broad outlines of the problem, coupled with his design of an experiment to overcome the limitations inherent in those simple observations, remain a solid blueprint for grounded scientific inquiry. His creative and prescient speculation about the conceptual underpinnings of social facilitation laid the groundwork for the important and statistically significant research that followed.

Appendix. Triplett's raw data (from Triplett, 1898, pp. 521–522)

TABLE I.

Subjects Stimulated Positively.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Violet F.	10	54.4	42.6	45.2	41.	42.	46.
Anna P.	9	67.	57.	55.4	50.4	49.	44.8
Willie H.	12	37.8	38.8	43.	39.	37.2	33.4
Bessie V.	11	46.2	41.	39.	30.2	33.6	32.4
Howard C.	11	42.	36.4	39.	41.	37.8	34.
Mary M.	11	48.	44.8	52.	44.6	43.8	40.
Lois P.	11	53.	45.6	44.	40.	40.6	35.8
Inez K.	13	37.	35.	35.8	34.	34.	32.6
Harvey L.	9	49.	42.6	39.6	37.6	36.	35.
Lora F.	11	40.4	35.	33.	35.	30.2	29.
Average	11	47.48	41.88	42.6	39.28	38.42	36.3
P. E.		6.18	4.45	4.68	3.83	3.74	3.74
Gains			5.6	.72	3.32	.86	2.12

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Stephen M.	13	51.2	50.	43.	41.8	39.8	41.2*
Mary W.	13	56.	53.	45.8	49.4	45.	43.*
Bertha A.	10	56.2	49.	48.	46.8	41.4	44.4
Clara L.	8	52.	44.	46.	45.6	44.	45.2
Helen M.	10	45.	45.6	35.8	46.2	40.	40.
Gracie W.	12	56.6	50.	42.	39.	40.2	41.4
Dona R.	15	34.	37.2	36.	41.4	37.	32.8
Pearl C.	13	43.	43.	40.	40.6	33.8	35.
Clyde G.	13	36.	35.	32.4	33.	31.	35.
Lucile W.	10	52.	50.	43.	44.	38.2	40.2
Average	11.7	48.2	45.68	41.2	42.78	39.	39.82
P. E.		5.6	4.	3.42	3.17	2.89	2.84
Gains			2.52	4.48	1.58	3.78	.82

* Left-handed.

Table II.

Subjects Stimulated Adversely.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Jack R.	9	44.2	44.	41.8	48.	44.2	41.
Helen F.	9	44.	51.	43.8	44.	43.	41.2
Emma P.	11	38.4	42.	37.	39.6	36.6	32.
Warner J.	11	41.6	43.6	43.4	43.	40.	38.
Genevieve M.	12	36.	36.	32.6	32.8	31.2	34.8
Average	10.4	40.84	43.32	39.72	41.48	39.	37.4
P. E.		2.41	3.57	3.25	3.85	3.55	2.52

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Hazel M.	11	38.	35.8	38.2	37.2	35.	42.
George B.	12	39.2	36.	37.6	34.2	36.	33.8
Mary B.	11	50.	46.	43.4	42.	48.	36.8
Carlisle B.	14	37.	35.4	35.	33.4	36.4	31.4
Eddie H.	11	31.2	29.2	27.6	27.	26.8	28.8
Average	11.8	39.08	36.48	36.36	34.76	34.4	34.56
P. E.		4.61	4.07	3.89	3.71	5.33	3.45

Table III.

Subjects little affected by competition.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Albert P.	13	29.	28.	27.	29.	27.	28.6
Milfred V.	17	36.4	29.	29.4	30.2	30.2	32.2
Harry V.	12	32.	32.	32.6	32.6	32.6	31.6
Robt. H.	12	31.4	31.4	32.2	35.4	35.	32.4
John T.	11	30.2	30.8	32.8	30.6	32.8	31.8
Average	13	31.8	30.24	30.8	31.56	31.5	31.3
P. E.		1.9	1.13	1.71	1.7	2.06	1.05

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Lela T.	10	45.	37.4	36.8	36.	37.2	38.
Lura L.	11	42.	39.	38.	37.	37.	38.
Mollie A.	13	38.	30.	28.	30.	30.2	29.6
Anna F.	11	35.	31.8	32.4	30.	32.	30.4
Ora R.	14	37.2	30.	29.	27.8	28.4	26.8
Average	11.8	39.44	33.64	32.84	32.16	32.96	32.16
P. E.		3.11	2.88	3.03	2.75	2.69	3.71

Notes

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1. In other respects, Triplett's study had glaring weaknesses and omissions. He reports collecting records for "nearly 225 persons of all ages" (p. 520) yet reports in detail the results for only 40 participants. Those participants apparently were not randomly assigned to the order conditions, or at least no mention is made of the assignment strategy. In addition, the nature of the pacers (e.g., sex, age, familiarity with participant) was not indicated, and the instructions given to them were not described (e.g., what pace they were to set). The timer (Triplett?) obviously was aware of the performance conditions, and the reliability of the stopwatch measures was not assessed. Participants in the co-actor conditions sometimes were given verbal encouragement during their races (p. 528), and some participants in alone conditions occasionally had observers in addition to the timer (p. 530).

2. Many contemporary accounts contain errors that suggest reliance on secondary sources or a careless reading of Triplett's original work. For example, some described Triplett's participants as having been asked to "wind string on a fishing reel" (Myers, 1999, p. 293), "wind up fishing reels" (Brehm et al., 1999, p. 249), "wind up fishing line on a reel" (Aronson et al., 2002, p. 306), and "wind in a fishing line" (Nairne, 2003, p. 461), as if they were asked to reel in line in a fashion typical of a fishing rod's use. As Figure 1 makes clear, however, the reels were used to make a silk thread traverse a closed circuit, in the fashion of a pulley, with no line actually being wound onto the reels. Another source (Bernstein, Clarke-Stewart, Penner, Roy, & Wickens, 2000) described the cycling observations as though they constituted the experiment conducted by Triplett. In fact, the flawed cycling observations motivated the more carefully conducted experiment with the winding apparatus.

3. A correction for Trial 1 performance is not possible here because the comparison of alone condition performance with co-actor condition performance is within subjects. The covariate is constant within subjects in this case.

4. Classification of participant sex was made possible by the inclusion of first names in Triplett's data tables (see *Appendix*). Most were unambiguous, but some (e.g., Milfred) took a bit of etymological research to determine, and one (Willie) was classified as female based on other statements Triplett made about the contents of his data tables. On p. 529, Triplett twice refers to the 16 girls and 4 boys in Table I (the group stimulated positively). As is clear from that table, the four boys are readily identified (Howard, Harvey, Stephen, and Clyde), leaving Willie H. as a girl (etymological sources, e.g., http://www.behindthename.com/, suggest Willie was used as an informal or pet name for both boys and girls).

5. These analyses tested for moderation by participant sex and participant age separately. Additional tests that included both participant age and sex in the same analyses also did not provide any evidence of moderation.

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