

# Do Paradoxes Prompt Better Attention and Recall? Implications for Publishing and Disseminating Academic Research

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## Abstract

In today's noisy media environment, researchers and the public alike find themselves inundated with information. Yet studies that find their way into high impact-factor journals and into the mainstream media often share a common feature—findings that contain some elements of a paradox. Moreover, paradoxes create surprise in the most seasoned experts, and surprise turns out to be a powerful driver of curiosity, interest, and recall. This study measured the effects of paradoxes on readers' comprehension of three versions of a news story representing academic research, containing explicit, implicit, and no paradox conditions. After reading, 98 undergraduate students enrolled in a business communication course responded to a question measuring their comprehension of one of the three versions of the passage both immediately after reading and after 3-5 days' recall, without re-exposure to the passage. Immediately after reading, 95% of readers of the paradox-explicit passage correctly grasped the gist of the study, compared with 14% of readers of the paradox-implicit version and only 4% of readers of the no-paradox version. Moreover, 3-5 days later, 55% of paradox-explicit readers correctly identified the meaning of the study, compared with only 7% of paradox-implicit readers. These findings may demonstrate the effects of incongruity, controversy, and surprise on curiosity and recall. In addition to shedding light on an understudied but powerful phenomenon, these findings offer potentially valuable implications for the reporting of research outcomes to academic journals and to the public via media outlets.

**Keywords:** paradox, surprise, controversy, memorability, reporting academic research, mass media

## 1. Introduction

### 1.1 Getting Heard in a Noisy Environment

In academic research, some aspect of the research design, methods, participants, or outcome must have novelty for the study to demonstrate some contribution to knowledge in the field to meet criteria for publication. In fact, in the highest impact-factor journals, editors request summaries for lay readers that foreground novelty in research ([http://www.nature.com/nature/authors/get\\_published/](http://www.nature.com/nature/authors/get_published/)). Compare, for example, the Editor's Summary with the opening paragraph of the actual Letter to *Nature*:

#### *Editor's Summary*

“Before the introduction of modern padded running shoes in the 1970s, and for most of human evolutionary history, humans ran either barefoot or in minimal shoes. **A comparison by Daniel Lieberman and colleagues of the biomechanics of habitually shod versus habitually barefoot runners now suggests that the collision-free way that barefoot runners typically land is not only comfortable but may also help avoid some impact-related repetitive stress injuries.**...Runners who don't wear shoes land more often on the ball of the foot or with a flat foot. This means that they often flex their ankles as they strike the ground and generate smaller impact forces than shod, rear-foot, strikers — compare the impact generated by landing from a jump on your heel versus your toes” [emphasis added].

#### *Letter to Nature*

“Humans have engaged in endurance running for millions of years, but the modern running

shoe was not invented until the 1970s. For most of human evolutionary history, runners were either barefoot or wore minimal footwear such as sandals or moccasins with smaller heels and little cushioning relative to modern running shoes. We wondered how runners coped with the impact caused by the foot colliding with the ground before the invention of the modern shoe...Fore-foot- and mid-foot-strike gaits were probably more common when humans ran barefoot or in minimal shoes, and may protect the feet and lower limbs from some of the impact-related injuries now experienced by a high percentage of runners” (Lieberman, Venkadesan et al., 2010).

In the Editor’s Summary, the second sentence lays out the paradox starkly and explicitly, noting that, ironically, barefoot runners minimized repetitive stress injuries encountered by runners wearing cushioned running shoes. However, the actual article on which the Editor’s Summary is based omits explicit mention of the paradox and, instead, merely ponders the differences between barefoot and shod gaits that may be the source of the impact-related injuries runners typically experience.

But the editors of *Nature* are not merely identifying the novelty in the research the journal publishes. Instead, the editors routinely feature paradoxes and foreground them in the Editor’s Summary sections in *Nature*. Moreover, most articles that cross from academic journals and into mainstream media coverage include a higher percentage of articles that contain explicit paradoxical relationships than those that do not. These paradoxes usually include

- Outcomes that reverse previous findings
- Mapping causal relationships between two states previously considered unrelated
- Discoveries that redress shortcomings of established methodology previously thought as immutable
- Inverse relationships between the magnitude of a problem and the paucity of research or insight into it
- Substantial costs attached to a problem versus a dearth of methods to redress it
- Relationship between an increase in focus/studies/interventions in a problem and increased problems associated with it
- Contrast between the apparent simplicity of a problem and its complex structure
- Overturning existing paradigmatic assumptions about causes and effects.

Moreover, these same paradoxical relationships may prompt more rapid acceptance of articles submitted to high impact-factor journals and may also influence the mass media’s coverage of studies published in academic journals that would otherwise go unnoticed by the public. In general, most people can easily name a news story from preceding months or even years that contained one of these paradoxical relationships: using hormone replacement therapy, rather than mitigating women’s risk of heart attack or stroke, actually increased it (Wassertheil-Smoller, Hendrix, et al., 2003); higher levels of income, beyond a certain annual salary, fail to produce concomitant increases in life satisfaction (Diener, Sandvik, et al., 1993); a simple one-minute “power pose” can increase your testosterone levels, decrease cortisol, and bolster both self-confidence and tolerance for risk (Carney, Cuddy, et al., 2010). In fact, the “power pose” remains a fixture in business school curricula and career coaching, despite researchers have roundly debunked its claims (Simmons & Simonsohn, 2017). However, the debunking of this widely-embraced research finding garners less attention and less memorability than the initial study, which spawned nearly 500 publications exploring the power of power posing. The answer lies less in wishful thinking—which played no role in the news coverage of the hormone replacement therapy study or of income levels and happiness—than in the role played by paradox on attention and recall.

### 1.2 Understanding the Role of Surprise in Memory

Paradoxical relationships represent an extreme version of surprise, which is itself a form of novelty (Pezzo, 2003). Mass media news and academic articles alike emphasize novelty (Berkowitz, 1987), in one study ranking novelty above significance and timeliness (Gant & Dimmick, 2000). However, novelty in research exists on a continuum, ranging from incremental improvements in our understanding of a phenomenon (Douglas, in press) to discoveries that violate a field’s central paradigms (Douglas, 2016). Moreover, as research into curiosity and attention reveals, mere novelty itself is less compelling of our attention and less likely to elicit recall than other types of information that provoke curiosity (Berlyne, 1954; Kang, Hsu, Krajbich et al., 2009). However, novelty itself stimulates us less than things that provoke curiosity (Kidd & Hayden, 2015). In fact, curiosity exerts the most interest and best recall when we feel driven to resolve uncertainty, one of the four basic motives common across humans (Kagan, 1972).

Psychologists who study curiosity argue that incongruity in information stimulates curiosity by creating a gap between what we already know and what we have yet to learn. This “information gap” (Loewenstein, 1994) drives us to resolve the incongruity by seeking information to fill the gap and thus resolve the incongruity we perceive. Moreover, our initial exposure to incongruity may create uncertainty, which we seek to diminish by discovering answers to the questions uncertainty raises (Golman & Loewenstein, 2015).

However, incongruity can also represent a case of heightened novelty, which would explain the power of paradox and its incongruities on our attention and memory alike. As Tulving & Kroll (1995) discovered, the human and primate brains both appear to have evolved to distinguish and encode into memory novel over familiar stimuli. Earlier studies (Anderson & Bower, 1972; Kinsbourne & George, 1974) amply support their discovery that we recall with greater ease words that we have less, not more familiarity, with. However, Tulving & Kroll argue that our recall of novel items occurs because the brain, at a neuronal level, uses a novelty-assessment system to screen out familiar items for further processing and encoding into long-term memory. At the same time, this same system selects novel stimuli or items for additional focus and recall (Tulving & Kroll, 1995; Kidd & Hadyen, 2015).

### *1.3 Well-established Effects with a Dearth of Research on Its Implications for Scholarship*

Despite interest in novelty, surprise, and memory dating from the early 1930s onward (Karis, Fabiani et al., 1984), no study to date has examined the impacts of the strongest form of novelty—incongruity or paradox—and its implications for disseminating research from academic journals into the mass media. Instead, studies have examined the extent to which an information gap stimulates consumer interest (Menon & Soman, 2002; Wiggin, Jain et al., 2014), drives purchasing (Hill, Fombelle et al., 2016) or participation (Park, Mahony et al., 2015) or motivates students to learn (Gentry, Burns et al., 2001).

However, the same incongruity or paradox that activates interest, processing, and encoding in long-term memory can also snag the attention of journal editors and peer reviewers and, potentially, of gate-keepers who award grant funding. Furthermore, academic journals are likelier to accept articles with some level of incongruity with prior studies as representing greater novelty, one of the most commonly used descriptions employed in journals’ aims and scope for research submitted to them (Ball, 2015). Ultimately, academic journals also enjoy greater prestige and exposure when articles get public exposure via the mass media. This doubled exposure not only enhances a study’s chances of getting published but only achieves academia’s aim of making the fruits of its research available to the public, thus broadening the public’s understanding of issues and potentially enabling consumers to make better choices (Jaffe, 1989; Morris & Shin, 2002). Ironically, this last item has received particular scrutiny as one of the drivers of curiosity, motivated by our belief that more information may help us make better decisions (Golman & Loewenstein, 2015).

### *1.4 Paradoxical Relationships Elicit Stronger Recall than Non-paradoxical Relationships*

This study sought to assess the power exerted by the strongest form of incongruity—paradox—on memorability, measuring the differences between the same content presented in three different ways: paradox-explicit, paradox-implicit, and no-paradox. The hypothesis: paradox-explicit versions of research would (a) gain a higher number of correct responses about the content and (b) receive a higher percentage of correct answers about the content on delayed recall, even after several days, without further exposure to the article’s content.

## **2. Method**

This study relied on student participants from a large, compulsory undergraduate writing course and challenged them to comprehend and recall the gist of a selection of two paragraphs that reported results from published academic research. Participants read and responded immediately to a question about the main point of the passage, then answered the same question without any re-exposure to the reading material in a follow-up question 3-5 days later.

### *2.1 Academic Research Translated into Three Conditions*

The study used an article, “Mechanical comparison of barefoot and shod running,” published in *International Journal of Sports Medicine* (Divert, Mornieux et al., 2005) as the source of a two-paragraph paraphrase, using the length of sentences and vocabulary readers would commonly encounter in a mainstream news story (Douglas & Miller, 2016a). Study participants received a link to a survey containing one of three versions of the paraphrase. In the first version, the paradox-explicit condition, the paradox the research explored was explicit and mentioned in the first sentence: the more expensive your running shoes, the greater your likelihood of injury. In this condition, readers discovered that more expensive and cushioned running shoes, rather than preventing injuries, instead, increased them. In the second version, the paradox-implicit condition, the paradoxical relationship was never made explicit. However, the two paragraphs did mention that expensive running shoes failed to prevent injury, with barefoot

runners reporting fewer injuries. In the third version, the no-paradox condition, the two paragraphs made no mention of any paradox or contradiction at all. Instead, the no-paradox condition merely discussed the history of running shoes and the ultra-marathon distances run by the Tarahumara people in Mexico, who usually run barefoot. In addition, the question, the same for all three conditions and for immediate reading and for follow-up, extrapolated real-world implications from the research. The correct answer, that the more cushioned and expensive one's running shoes, the greater the likelihood of injury, not only emphasized paradox but also phrased the research in terms that could inform public understandings of academic research—and potentially influence later decisionmaking. (See Appendix for the survey's contents.)

To ensure the passages had the same ease of reading, words and sentences were standardized for length, syntax, and diction, using Lexile® and Ai's L2 Syntactic Complexity Analyzer (Lu & Ai, 2015) measures which more accurately assess the challenges of reading words in sentences and paragraphs than the commonly-used Flesch, Flesch-Kincaid, and FOG indices of readability. Long-standing readability measures mainly assess the median length of sentences and clauses (Douglas, 2015). In contrast, Lexile® relies on a large corpus of published work that calibrates the length of sentences and the frequency with which words appear in English with a score reflecting the difficulty in reading materials (Douglas & Miller, 2016a). Nevertheless, all three passages also underwent analyses for Flesch, Flesch-Kincaid, and FOG indices to ensure identical readability across all three conditions to avoid any potential confounders in comprehension and recall due to one version having lower readability than others.

## 2.2 Study Participants

Undergraduate students in a large business writing course received one of three email invitations to participate in a survey, differing only in the embedded link to one of the three versions of the passage. Participation was purely voluntary, with students opting in only if they decided to click the link embedded at the end of the passage. The writing course enrolls 340 undergraduate students majoring in business administration and is compulsory for students completing a Bachelor of Science degree in any field in business. The median age of students in the course is 20 years of age, and course enrollments reflect a near 50/50 split between male and female students.

## 2.3 Research Design

Student email addresses were selected from the 340-student comprehensive course roll and assigned to read one of the three versions of the reading based on the section in which they enrolled. The course had 18 sections, so students in six sections received an email with a link to the paradox-explicit passage, while students in six other sections received a link to the paradox-implicit passage, with students in the remaining six sections receiving a link to the no-paradox passage. All students viewed the same question about the meaning of the passage, as well as the same follow-up question, repeated between three to five days after reading the passage. Similarly, all students had the same multiple choice responses in the same order across all three conditions to avoid any confounding effects from the order of potential answers. The question had four potential answers, all equally plausible, to avoid cueing readers to the correct response. Moreover, the question required readers to derive from their reading a real-world implication from the passage that could inform later decision-making. As a reward for responding to the days 3-5 follow-up question, students' email addresses registered students for a random drawing for two \$50 Amazon gift cards to create incentive for students to respond to the initial questionnaire and follow-up. The three-to-five-day interval for follow-up maximized the number of participants responding to the full study, as this window enabled more students to participate with two days' leeway prior to the survey closing. In addition, this length of time between initial exposure to the passage and recall without access to the material provided an accurate and durable measure of long-term memory, as students would have encountered potentially hundreds of passages from the news, Internet news feeds, and classroom required reading in the interval between first encountering the reading and recalling the gist of the material, thus putting the durability of their recall of the passage to a particularly challenging test of long-term memory.

## 3. Results

### 3.1 Survey Responses

Of the 340 students who received email links to the surveys, 98 responded to the initial survey across all three conditions, but only 60 responded during follow-up during days 3-5, representing only 61% of the initial respondents. Our statistical analysis, using Fisher's exact test, confirmed that the respondents who neglected to respond to the days 3-5 follow-up question were merely lost to follow-up, not based on the version of the passage they read.

### 3.2 Statistical Analysis

In scoring the responses to the question that existed across all conditions and recall, the four answer choices were reduced to a binary outcome: correct or incorrect. Fisher's exact test was used to test the null hypothesis of no association existing between the passage content—paradox-explicit, paradox-implicit, no-paradox passages and participants' responses to the question. Secondly, the magnitude of the association was established through a logistic regression model. The odds of a correct response were then compared pairwise between the paradox-explicit answers and other the paradox-implicit and no-paradox answers. To perform this analysis, a 95% confidence interval was constructed of their odds ratios. Fisher's exact test also established a high correlation between the content of the passage and the response on both initial recall ( $p$  value = <0.0001) and on recall at days 3-5 ( $p$  value = <0.00028).

### 3.3 Immediate Recall

After reading the passage, the participants grasped the gist of its meaning with far greater accuracy from the paradox-explicit version than from the paradox-implicit or the no-paradox versions. In the paradox-explicit group, 90% of participants answered correctly ( $n=40$ ). In contrast, only 15% of the paradox-implicit group ( $n=6$ ) answered correctly, while none of the no-paradox group correctly grasped the gist of the passage. Strikingly, although an equal number of participants had received invitations for the survey, the paradox-explicit ( $n=44$ ) and paradox-implicit conditions ( $n=43$ ) elicited a higher response rate than did the no-paradox condition ( $n=11$ ).

### 3.4 Recall at 3-5 Days

Despite only brief exposure to a two-paragraph passage, participants' recall of the passage's meaning was nearly eight times greater for the paradox-explicit version than for the paradox-implicit version. For the no-paradox condition, so few participants responded that their response rate would lead to a skewed interpretation of results ( $n=5$ ). In the paradox-explicit group, 55% of participants ( $n=16$ ) still correctly recalled the meaning of the passage they read. But, in contrast, only 7% ( $n=2$ ) correctly recalled the content of the paradox-implicit passage. Finally, the no-paradox condition elicited less than 5% response rate, while the paradox-explicit generated a 30% response rate and paradox-implicit conditions elicited a 26% response rate from the readers who opted in to the initial survey on Day 1 (see Table 1).

Passage Conditions	Correct Recall – Total Responses – Day 0	Correct Recall – Total Responses – Days 3-5
Paradox Explicit	40 / 44	16 / 29
Paradox Implicit	6 / 36	2 / 26
No Paradox	0 / 11	1 / 5

## 4. Discussion

Clearly, paradox represents such a strong version of incongruity that it elicits greater attention and encoding for later retrieval than the same information, even when presented in a way that implies a paradox present in the material. On immediate recall, the paradox-explicit readers had six times the accuracy in identifying the meaning of the research than the paradox-implicit group. In contrast, the no-paradox group failed entirely to comprehend the meaning of the research. Moreover, on recall as many as five days later, more than half the paradox-explicit readers recalled the meaning of the passage, compared with less than 10% of paradox-implicit readers. Tellingly, the no-paradox condition elicited the lowest participation rates on both immediate exposure and recall, representing only 7% of participants of the follow-up condition, in contrast with the third of participants who responded to the paradox-explicit recall survey. Perhaps most important, readers of the paradox-explicit condition correctly identified implications of the research that could translate into better-informed consumer decisions in future.

### 4.1 Paradox Interferes with Routine Processing

These findings are entirely consistent with the spectrum of studies that have explored the puzzle of interference and incongruity in semantic recall, using either spoken or written pairs of words (Hirshman, 1988; Hirshman, Trembath et al., 1994). In fact, this study supported an effect first noted in 1933 by the researcher from whom the effect gained its name, the von Restorff Effect, where participants readily recalled only the most incongruous or distinctive items from lists of otherwise related words (Hunt, 1995). In turn, at the sentence level, incongruous or, in the labels of some researchers, distinctive sentences elicit more accurate recall than sentences that play out according to routine

expectations (Glover, Bruning et al., 1982; Tulving & Kroll, 1995). According to this hypothesis, we enjoy an evolutionary benefit from allocating scarce attentional resources away from the routine and familiar, which seldom pose significant threats, and toward the unusual and unfamiliar (Karis, Fabiani et al., 1984). The result, in the safe and even routine settings of surveys and laboratories, leads to our greater focus on and recall of things that are unfamiliar, surprising, and, especially, startling. On a spectrum of distinctiveness, the familiar exists at one end, with paradox occupying the opposite end (Schmidt, 1991). These effects may also reflect the impact of surprise on recall via the heightened attention garnered at a neuronal level. This heightened attention results in further processing of perceptions, leading to encoding in long-term memory (Kang, Hsu et al., 2006; Kang, Hsu et al., 2009; Kidd & Hayden, 2015).

#### 4.2 Implications for Writing up Research

Top-ranked, high impact-factor journals including *Nature*, *Science*, *Cell*, *PLoS One* reject 6,000 submissions a year, with some journals reporting as many as 12,000 submissions a year, with each year adding from 15-200% more submissions than the prior year (McCook, 2006). To make a paper stand out at the initial gate-keeping and peer-review stages, researchers should pay attention to potential paradoxical relationships between elements in their research, especially in the framing of a hypothesis or in reporting the implications of their findings. In addition to focusing attention on a submission, a paradox can also potential exert a priming effect (Lupker, 1984; McNamara, 1994; Nicholas, 1998; Pickering & Branigan, 1998; Chang, Dell et al., 2000; Pickering & Ferreira, 2008), enabling editors and peer reviewers to easily make sense of even complex findings. In addition, paradoxical relationships enhance editors' and peer reviewers' sense of novelty (Tulving & Kroll, 1995), while the article itself can elicit greater attention during peer review. As a result of the heightened attention that stems from paradoxes representing incongruity, peer reviewers may associate the readiness with which they recall the study with its overall merits. Even if they fail to make this association, however, editors and reviewers will perceive the study as novel, meeting one of the more important criteria for publication in most academic journals, reflected in the increasing use of the term "novel" to characterize studies and findings alike (Ball, 2015).

#### 4.3 Bridging the Gap between Academia and the Public

The most important implication of this study lies in its utility to researchers in communicating results to the general public. Long criticized as an "ivory tower," academia can often seem remote to the general public, a place where research has become increasingly inaccessible either due to academics deliberately making their writing less accessible (Ball, 2017; Plav čin-Sigray, Matheson et al., 2017) or to the emergence of "noun-speak," the increased use of complex nominals (Levi, 1978; de Izquierdo & Bailey, 1998) that significantly decrease the readability of sentences (Douglas & Miller, 2016b). Following this trend, even public policy documents, like the UN's reports on climate change, have become increasingly unreadable (Tollefson, 2015), making the gulf between researchers and the general public loom larger, even as the stakes grow for keeping the public informed of increasingly rapid changes in our understanding of the world.

#### 4.4 Conclusions

This study's findings can help remedy that increasing gap in three ways. First, studies with paradoxes may receive more coverage in mainstream media like newspapers, and national television and radio new programs than studies that lack them for the same reasons why our readers recalled the paradox-explicit article with such acuity as long as five days after reading two paragraphs. Second, if researchers explicitly foreground any paradoxes implied in their hypotheses or data in press releases that accompany the publication of their research, they increase the likelihood that news media will cover their findings, as their press release meets three of the central criteria for newsworthiness: novelty, significance, and timeliness (Gant & Dimmick, 2000). Third, because subject-matter experts seldom grasp how to phrase their research in ways readily comprehensible to the general public, let alone news outlets, researchers should seek out the media relations teams for their colleges or universities. But, in communicating these findings to media relations, researchers must make the paradoxes in their research explicit and, optimally, mention the paradox early to create a priming effect on both news editors and the writers in their media relations office. And, fourth, paradoxes may ensure that research results get understood and recalled by lay readers, enabling them to make better decisions about issues that range from finance to nutrition and healthcare.

### Appendix: Survey Contents

#### *Paradox-Explicit Condition*

#### **The Problem with Running Shoes**

The more you pay for your next pair of running shoes, the more you've just increased the odds of your getting

injured while running. Over the past decade, scientific research into runners, running shoes, and running-related injuries suggest that runners wearing the most expensive running shoes had the *highest* rates of injury. This research was initially triggered by researchers' convictions that runners with the most cushioning on their feet tended to strike the ground with greater force than runners with less cushioning on their feet. Every year, manufacturers of running shoes spend millions on research and development to come up with the latest device to protect the feet, joints, and muscles of dedicated runners. In the past five years alone, manufacturers have introduced shoes like the Vibram Five Fingers, Terra Plana's Vivo Barefoot, and the Nike Fre, all shoes designed to mimic the advantages of barefoot running while still providing some protection to the feet.

This recent change in attitudes toward running shoes has coincided with studies of cultures where barefoot running has a long-standing tradition. The most striking of these cultures, the Tarahumara Indians, indulge in 150-mile races through baking rocky canyons in Mexico. Amid deep canyons and high mountains, few roads exist and travel by vehicles or even animals is largely impossible. As a result, the Tarahumara have long depended on their feet to cover daily distances of fifty to eighty miles, wearing only huaraches made out of old tire tread and leather straps, using a distinctive stride, landing on the balls of their feet and keeping their hips squarely beneath them.

#### *Paradox-implicit Condition*

##### **The Problem with Running Shoes**

The British Ad Council has accused manufacturers of running shoes of misleading the British public by encouraging them to pay more for running shoes that fail to provide any protection against injuries while running. For decades, manufacturers have used extensive research and development to create and market running shoes that promise to minimize the injuries dedicated runners typically experience from the pounding of their feet and joints against the ground. But, in fact, expensive shoes do no better of a job in protecting runners' feet than cheaper shoes with little to no cushioning.

This recent change in attitudes toward running shoes has coincided with studies of cultures where barefoot running has a long-standing tradition. The most striking of these, the Tarahumara Indians, indulge in 150-mile races through baking rocky canyons in Mexico. Amid deep canyons and high mountains, few roads exist and travel by vehicles or even animals is largely impossible. As a result, the Tarahumara have long depended on their feet to cover daily distances of fifty to eighty miles, wearing only huaraches made out of old tire tread and leather straps, using a distinctive stride, landing on the balls of their feet and keeping their hips squarely beneath them.

#### *No-paradox condition*

##### **The Problem with Running Shoes**

When Roger Bannister ran the first mile to be run in under four minutes, on his feet he wore the standard track cleats athletes of his day wore. But twenty years later, a University of Oregon track coach, seeking a means of helping his athletes run better on the university's new urethane track, poured liquid urethane into his wife's waffle iron—and ignited an entire industry, dedicated to building a better running shoe. The waffle soles Bowerman created became the foundation of the Nike empire, which later produced shoes incorporating everything from air, flywire, and lunarlite foam into shoes, all aimed at reducing their weight and injuries to the athletes who wear them. Today, Nike's latest creation is the Fre, a shoe aimed at making runners perform as though they're wearing nothing at all on their feet.

This recent change in attitudes toward running shoes has coincided with studies of cultures where barefoot running has a long-standing tradition. The most striking of these, the Tarahumara Indians, indulge in 150-mile races through baking rocky canyons in Mexico. Amid deep canyons and high mountains, few roads exist and travel by vehicles or even animals is largely impossible. As a result, the Tarahumara have long depended on their feet to cover daily distances of fifty to eighty miles, wearing only huaraches made out of old tire tread and leather straps, using a distinctive stride, landing on the balls of their feet and keeping their hips squarely beneath them.

#### **Question:**

The main point of this article is

1. The more you pay for running shoes, the greater your odds of getting injured while running. (correct)
2. Cushioned running shoes are better for your feet than barefoot running. (incorrect)
3. You should buy the most expensive running shoe you can find. (incorrect)
4. You'll get injured running eventually, no matter what kinds of shoes you wear. (incorrect)

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