



tion source clearly has not been stationary with respect to Earth's spin axis, because the latitude of the Emperor seamount eruptions decreased with time until roughly the time of the Hawaiian-Emperor bend (9). Duncan and Keller (8) recently showed that the rate of propagation of volcanism along the Emperor section of the seamount chain varied considerably, first speeding up and then slowing down. Sharp and Clague now show that the change in orientation of the seamount chain was not abrupt: The change started 50 million years ago and took more than 8 million years to complete.

The revision of the age of such a tectonic feature by 7 million years has far-reaching consequences. Studies of plate motions and mantle dynamics that assumed a younger age of the bend will have to be adjusted (10, 11). Plate reconstructions based only on marine magnetic anomalies from seafloor spreading centers are not affected, but the exact rates of relative hot spot drift calculated from these reconstructions (12) may have to be adjusted in light of the new ages assigned to the Hawaiian-Emperor volcanism. There will be better agreement between two different methods for determining the northward motion of the Pacific plate—one based on sedimentation patterns that show when locations on the Pacific plate crossed the equator (13), the other based on the age progression of the Hawaiian seamounts.

The new ages for the Hawaiian-Emperor bend and seamount chain help to clarify the

A typical ocean island volcano. These cross sections of an ocean island volcano such as a Hawaiian seamount illustrate the main stages of its evolution: preshield alkalic stage (A), main shield-building stage (B and C), postshield alkalic stage (D), and rejuvenated stage (E). The rocks most easily sampled or dredged on the volcano's surface can be considerably younger than the major phase of volcanism that built the volcano.

connections among mantle dynamics, Pacific plate motion, and major reorganizations of plate boundaries in the western Pacific Ocean. The Aleutian, Izu-Bonin-Marianas, and Tonga-Kermadec subduction zones, which all started between 55 and 45 million years ago, involved major changes in the geometry and forces at the boundaries of the Pacific plate (14, 15). None of these geometric changes could have occurred unless there had already been a change in the relative velocity of the Pacific plate with respect to adjacent plates. The time lag between these changes and the occurrence of the Hawaiian-Emperor bend was a major conundrum; the problem has now been removed by Sharp and Clague. Their results will spur new efforts to model mantle dynamics and plate kinematics through times of major changes in plate configuration, as well as additional data collection efforts.

More details of the spatial variation in paleolatitude and in volcanic propagation rates for the Hawaiian-Emperor volcanic seamount chain remain to be identified, and the published age progressions of other volcanic seamount chains will need to be scrutinized. The results of Sharp and Clague highlight the key role

played by ocean drilling on this and many other seamount chains.

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BEHAVIOR

The Power of Social Psychological Interventions

Timothy D. Wilson

Brief social psychological interventions that focus on people's perceptions of themselves and their environment have been shown to increase academic performance.

Some readers will undoubtedly be surprised, or even incredulous, that a 15-min intervention can reduce the racial achievement gap by 40%. Yet this is precisely what Cohen *et al.* (1) report on page 1307 of this issue. African American seventh graders randomly assigned to write about their most important values achieved significantly better end-of-semester grades than students in a control condition. How can this be?

As the authors note, these results are not

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unprecedented. Previous studies have found results of similar magnitude in samples of United States college students (see the table) (2–4). These studies share important features: Each drew on social psychological theories to change people's self- and social perceptions (i.e., people's explanations for their poor performance, their views of the malleability of their own intelligence, or their sense of social connectedness). Each did so with brief, inexpensive interventions. In each study, people in the treatment conditions achieved better grades than people in the control conditions. These increases were

modest, averaging .29 on a grade-point average (GPA) scale (where A = 4, B = 3, and so on; see the table). Nonetheless, these gains are impressive, given that grades were assessed from several weeks to several months after the interventions.

The Cohen *et al.* study adds substantially to this earlier work. They used an intervention tailored to help African Americans, a group that has underperformed in American educational settings (5). Students in the treatment

opposing forces exist in a delicate state of equilibrium, such that small interventions can set in motion processes that change the entire system. Altering people's views of themselves, or how they think others view them, can lead to cascading changes in motivation and performance. For example, students can be caught in a self-perpetuating "exacerbation cycle," whereby poor academic performance confirms their worst fears about themselves, which increases their anxiety, which

The fact that small, theory-based interventions can have large effects should not be taken as a criticism of large-scale attempts at social change. As important as people's conceptions of their environment are, often the environment itself needs changing. The achievement gap is surely caused by multiple factors, including poverty, racism, and lack of parental involvement (6). Findings such as Cohen *et al.*'s should not divert our attention from these critical problems. By the same token, the fact that large-scale societal factors need changing should not prevent us from seeking proximate solutions that are easy to implement.

There are, of course, limitations to the findings from these studies, as well as many unanswered questions. It is not clear why students in the Cohen *et al.* sample failed to self-affirm on their own. Why did it take an in-class essay to focus students' attention on values that were important to them? Issues of generalizability also arise, such as whether the self-affirmation exercise would work with younger age groups. These questions can be answered only with additional experiments, ideally ones as well conducted as the Cohen *et al.* studies.

Social psychological interventions		
Participants	Intervention	Increase in GPA
African American 7th graders (1)	Students wrote about why a selected value was important to them	0.30
First year college students (2)	Information that grades improve after the first year	0.27
College students (3)	Information that intelligence is malleable	0.23
African American college students (4)	Information that worries about social belonging lessen over time	0.34

Better grades. Brief theory-based interventions improved students' grades [increases shown on a four-point grade point average (GPA) scale, relative to randomly assigned control groups].

condition spent 15 min writing about why certain values, such as relationships with other people, were important to them. Students in the control condition wrote about why specific values were important to other people. African American students in the treatment condition achieved better end-of-semester grades than did African American students in the control condition. These results are especially encouraging given how intractable a problem the racial achievement gap has appeared to be (6).

The Cohen *et al.* study and the others like it illustrate key social psychological points. It can be as important to change people's "construals"—their interpretations of the social world and their place in it—as it is to change the objective environment. In none of the studies, for example, was there an effort to change the quality of the instruction students received, the clarity of the texts they read, or any other objective feature of the educational environment. Instead, the researchers attempted to change students' construals of themselves or how other people viewed them, with promising results. The objective environment is obviously important as well; as Cohen *et al.* note, the success of their intervention depended on students being in a supportive environment. How people perceive that environment, however, can be key to bringing about lasting change.

Brief theory-based interventions that focus on people's construals can reap large benefits. Kurt Lewin, the founder of modern social psychology, noted that many behavioral patterns are the result of a complex interplay of opposing social forces, resulting in a "tension system" (7, 8). Sometimes these

hampers their subsequent performance, which further confirms their worst fears, and so on (9, 10). Giving people nonpejorative explanations for poor performance (e.g., everyone has to "learn the ropes" at college) can interrupt this cycle and prevent its spiraling consequences (2, 11).

The success of such interventions—indeed, of any intervention—is best tested with experimental designs in which people are randomly assigned to treatment and control conditions. As obvious as this point is in some settings (e.g., tests of medical treatments), it is not fully appreciated in others (e.g., educational settings, in which new programs are frequently implemented without being evaluated experimentally) (12). There are a number of reasons for this, such as people's reliance on common sense to judge the effectiveness of interventions in familiar domains (e.g., the classroom). A lesson of the studies reviewed here is that common sense is sometimes wrong. Without the experimental results presented by Cohen *et al.*, who would have thought that a 15-min exercise would have had such long-lasting effects?

Social psychological theories, based on carefully conducted laboratory experiments, generate (often nonobvious) predictions about human behavior. Dozens of experiments, conducted primarily with college students in laboratory settings, have documented the damaging effects that stereotypes about one's group can have on individuals' performance (known as stereotype threat), as well as relatively simple ways of avoiding this damage (13–15). The Cohen *et al.* intervention follows directly from this basic research.

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