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# The BEHAVIORAL MEASUREMENT Letter

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## Introduction to This Issue of The Behavioral Measurement Letter

This issue of *The Behavioral Measurement Letter* includes three articles addressing very different topics: namely, "reactive insight" effects, impact of bullying, and the role of measurement in mountaineering. Although these articles appear at first glance to have little to do with one another, in fact they share a central focus on measurement. Indeed, the diversity of their subject matter underscores measurement's amazing breadth of relevance.

In this issue of *The Behavioral Measurement Letter*, Eric Lang explores long-lasting ways in which answering self-report questions can change respondents' thoughts, feelings, and behaviors. He refers to these influences as "reactive insight" effects. Lang notes both positive and negative consequences that may result from research participation. On the positive side, for example, research participation can make respondents see more strengths than weaknesses in their marriage; and completing open-ended questions about self-relevant issues can reveal new behavioral options, clarify personal priorities, and force one to confront problems that one might otherwise ignore.

On the negative side, however, answering self-report questions can also increase interpersonal conflict between partners, through increased communication. Although one could argue that this is not necessarily a negative outcome, it definitely raises ethical concerns about informed consent among research participants. Lang carefully considers the ramifications of "reactive insights" and urges researchers to pay closer attention to this important phenomenon. He also notes specific characteristics of research designs

(e.g., breadth of measurement coverage, issue relevance) and participants (e.g., introspective skill, motivation for self-discovery) that may increase the likelihood of reactive insight effects.

Also in this issue of *The Behavioral Measurement Letter*, Missy Fleming highlights the importance of measurement in understanding and solving the problem of bullying in the United States. She begins by defining bullying as a pattern of repeated verbal, nonverbal, or physical aggression against another person featuring a deliberate intent to harm the person without regard for the victim's suffering. As she persuasively argues, bullying is a form of conduct disorder that poses special dangers in American school systems.

Fleming insightfully discusses the widespread nature of bullying in our society, its prevalence among both boys and girls, its causes and consequences, and how researchers currently measure this problem behavior. She notes the challenge of constructing measurement instruments that are not only sensitive, valid, and reliable, but also nonthreatening, multifaceted, and age- and culture-appropriate. And she points out the need for more psychometric research to determine the conceptual overlap and uniqueness among alternative measures of bullying. Her article serves as a call for action among researchers, educators, and parents alike.

Finally, Fred Bryant's article in this issue of *The Behavioral Measurement Letter* highlights the vital role that measurement plays in climbing the world's highest mountains, the 8000-meter peaks of the Himalaya. In the process, he drives home the crucial importance of measurement in any human endeavor in which it is important to make

correct decisions. Just as Type I errors (i.e., concluding something is there when it actually is not) and Type II errors (i.e., concluding nothing is there when it actually is) matter in research, they matter even more in high-altitude mountaineering, where such mistakes are often fatal.

Although few of us will ever try to reach the summit of Mount Everest, mountaineers and researchers alike share a common concern for accuracy in measurement. Bryant notes real-life cases from the mountaineering literature in which careful measurement enabled climbers to make the right choice, and other cases in which inaccurate measurement cost lives. Clearly, whether in the laboratory or on the heights, measurement matters.

Please address comments and suggestions to The Editor, *The Behavioral Measurement Letter*, Behavioral Measurement Database Services, PO Box 110287, Pittsburgh, PA 15232-0787.

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HaPI reading . . .

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The Repercussions of  
Research Participation:  
Exploring Reactive Insight Effects

Eric L. Lang<sup>1</sup>

Each year, hundreds of social science and health surveys, involving tens of thousands of respondents, are conducted by researchers at universities, local and federal government agencies, health centers, foundations, businesses, nonprofit think tanks, and other organizations in an effort to advance basic and applied research across a number of broad domains, such as psychology, sociology, gerontology, and public health. The surveys are designed to make objective assessments of individuals and groups and, in the case of representative sample studies, to describe and predict important aspects of larger populations. Many social science and health surveys include assessments of personal and potentially stimulating topics such as sexuality, grief, courtship, family life, stress and coping, parenting, marital quality, personal adjustment, happiness, risk behavior, socialization, developmental issues, and mental health. Although generally underresearched, there is a small but growing body of literature indicating that the experience of participating in surveys of this kind — particularly those that involve repeated assessments of sensitive topics over time — may inadvertently stimulate respondents to think about themselves, their lives, and their plans in new ways. The potential consequences of this type of reactive insight are two-fold. First, reactive insight may systematically bias survey assessments in certain areas and decrease their descriptive and predictive reliability for larger populations. Second, reactive insight may elicit nontrivial changes in respondents' thoughts, feelings, or behaviors that are neither salutary nor short-lived. Consequently, improving research on reactive insight may contribute to several

<sup>1</sup>Initial support for this work was provided by an NIMH grant (MH14661-01) to the author, while employed at Sociometrics Corporation. Continuing support for this work has been provided by the Prosocial Science Institute. The author gratefully acknowledges research assistance provided by Dr. Harley Baker and Dr. Stephen Henne. This paper is based, in part, on a presentation — *Reactive Insight Effects on Participants in Two Panel Studies* — by the author at the American Psychological Association annual convention, August 26, 2001 (San Francisco, CA). Correspondence should be directed to Eric L. Lang, PhD, Prosocial Science Institute, 22 Loma Vista Place, Monterey, CA 93940, USA (eric@prosocial.com).

important areas, such as research design, measurement protocols, informed consent, the social psychological dynamics of personal reflection, and statistical error correction. The remainder of this paper briefly discusses the concept of reactive insight and a summary of recent results from an investigation of two five-wave panel studies.

### Defining Reactive Insight

The term "reactive insight" was originally developed by the author to connect the concept to the established literature on reactive measurement error, and to focus attention on the experience of the research participant, especially as it relates to the social psychological dynamics of respondent introspection, considerations of personal relevance, self-concept, and their potentially enduring effects.

The more general concept of reactive measurement error is not new. One of the classic treatises of this concept appears in work by Webb, Campbell, Schwartz, and Sechrest (1966) who describe four classes of potential bias, i.e., threats to measurement validity, that are "produced by the respondent" as a reaction to research methods<sup>2</sup>. The four classes are: (a) awareness of being tested, (b) role selection, (c) response sets, and (d) measurement as a change agent (p. 13). The first three classes relate to a broad base of research showing that survey responses and research performance can be influenced by a variety of factors, such as respondents being self-conscious of research conditions, wording differences among questionnaire items, and cues regarding researchers' expectations or desires. For example, there is over 60 years of literature investigating response set phenomena such as respondents' propensities for agreeing with a statement, rather than disagreeing with its opposite (Sletto, 1937; Krosnick & Schuman, 1988). Furthermore, the "Hawthorne" studies describe a variety of ways that experimentally induced changes in subjects' working conditions elicited altered behavior among workers who knew they were the subject of additional attention, although the methodology employed in those studies precluded precise causal interpretations (Lang, 1992). Hawthorne-type

effects were subsequently clarified through studies of "demand characteristics" of participating in research (Lana, 1969). Overall, measurement reactivity based on awareness of being tested, role selection, and response sets appear to share the common features that the reactive effects are both short-lived, e.g., confined to the immediate aspects of the data collection, and substantively limited to areas of the original research questionnaire or protocol.

In contrast, the fourth class of reactivity, which Webb and colleagues (1966) termed "measurement as change agent," comes closer to what should be defined as *reactive insight*, in that it relates to reactivity effects that produce long lasting change. Early studies of such change included studies of practice effects, e.g., enhanced performance due to repeated exposure to similar questions/tasks, and preamble effects, e.g., the creation of new and sustaining opinions among respondents who are asked for an opinion about a topic on which they previously had invested little thought (Cantril, 1944). More recently, Jagodzinski, Kuhnle, and Schmidt (1987) suggested that research participation may actually increase the importance of issues already salient to the respondent, i.e., "that the item content becomes more salient and central to many respondents because of the measurement process itself" (p. 262). Eliminating from the definition simple practice effects that yield mostly superficial changes in test performance serves to further distinguish reactive insight as a unique, personal, and important concept. Thus, reactive insight effects can be defined as *long lasting change in a respondent's self-concept, attitudes, emotions, well-being, or behavioral tendencies as a result of research participation*.

It is not a requirement that the respondent is aware of participating in research, although survey respondents obviously have such awareness. Instead, growing evidence suggests that, for some participants and contexts, research participation causes directly — or indirectly, e.g., through enhanced sensitivity to other social, environmental, or eliciting agents — lasting changes as described above.

<sup>2</sup>Webb et al. (1966) distinguished effects produced by the respondent from effects produced by the researcher, such as the class of biases known as "interviewer effects."

### Prior Research on Reactive Insight

The "Boston Couples Study." Rubin and Mitchell (1976) interviewed several hundred unmarried couples, in one of the classic investigations of participation effects. Over a two-year period, study respondents (individually and as couples) completed questionnaires and interviews regarding communication processes. One year after the study, nearly half of all respondents reported (through closed and open-ended questions) that the study had an impact on their relationship. Typical open-ended responses included the following.

*My relationship had been floundering at the time I first took part in the study, and because of some of the questions were really soul-searching, I re-examined where we were headed. She was much more serious than I was and I called it off. (p. 19)*

*The study forced us to think about our relationship in concrete terms ("Who is more open?" "Who is more involved in decision making?" etc.) and deal with it as an interpersonal relationship per se, rather than as merely another dating situation. (p. 19)*

Rubin and Mitchell attributed such effects to processes of "definition," e.g., having to describe one's situation, and "disclosure," e.g., the subsequent increase in communication between respondent pairs. The authors conclude:

*By asking couples to scrutinize their relationships and by prompting them to discuss their relationships with one another, our study played a role in shaping these relationships. In some cases, our study served to strengthen a relationship; in other cases, to facilitate its dissolution. In the process, we unwittingly became couples counselors. (p. 17)*

During the first stage of a follow-up to that study over 10 years later, Rubin noted evidence that the divorce rate among approximately 100 study couples who had gotten married was extremely low. Rubin suggests that "it seems quite possible that our study — in helping to cement some

relationships and to shake up others, before marriage — contributed to this result" (Rubin, 1986).

University of Texas at Austin Studies. Hughes and Surra (1997)<sup>2</sup> conducted a three wave panel study of an initial sample of 120 (60 couples) over the course of a year. The study focused on premarital relationships using questionnaires and telephone interviews. Closed-ended and open-ended questions were also included to assess psychological and dyadic effects related to frequency of study participation, i.e., the total number of 11 possible telephone interviews completed. Analysis yielded several dimensions related to participation effects, such as "increased awareness of relationship processes," effects on relationship activities," "relationship defining influences," and "relationship-evaluating influences." The last influence was positively related to the number of interviews completed and to scores on a measure of relationship satisfaction.

In a similar longitudinal study of commitment among 232 heterosexual dating couples (n=464), Williams and Surra (1998) found that frequency of participation in up to nine study interviews as positively associated with relationship satisfaction for men but not for women. Furthermore, this effect was not dependent on prior levels of relationship satisfaction. However, further analysis and revised results from this study suggest that more frequent participation is associated with negative changes in relationship satisfaction or conflict for men and women in longer relationships (Surra & Williams, 2001, under review).

UCLA Studies. Bradbury (1994) conducted two studies of marital research that included closed- and open-ended assessments of reactive insight. Study 1 included 60 newly wed couples (n=120) interviewed twice over a six-month period. Study 2 included 47 couples (n=92) — in marriages that averaged 8 years — who participated in a laboratory study of dyadic communication. In study 1, Bradbury found that research participation resulted in respondents seeing more strengths than weaknesses in their marriage. Wives were more

<sup>2</sup>This research was originally reported at the National Council on Family Relations Preconference Workshop on Theory Construction and Research Methodology, Baltimore, MD, November 11, 1993.

likely than their husbands to report that the study affected the way they thought about their marriages. Furthermore, 72% of respondents reported a positive experience, 5% negative experience, 3% "mixed," and 20% reported no effect of research participation. Of those that reported a positive effect, 67% emphasized intrapersonal changes, 30% focused on interpersonal changes, and 3% mentioned other effects, such as feelings of altruism. In Study 2, Bradbury assessed a methodological dimension and concluded that the dyadic communication research task tended to sample typical problem-solving discussions, rather than creating artificial or overly troubling communications. In other words, the reactive insight effects were not the result of atypical discussions initiated by the research protocol.

University of Michigan Studies. Veroff and colleagues — in their 1992 Early Years of Marriage (EYM) Study — report on the only known study of reactive insight that randomly assigned participants to either an experimental group that completed extensive questionnaires, interviews, and dyadic communication tasks over 4 waves of assessment, or to a control group that completed shortened versions of the interview and questionnaire, and were assessed less often. Experimental group participants showed greater reactive insight effects (mostly positive) than did the control group on measures of marital satisfaction and well-being. "These results suggest that better-adjusted marriages may have developed among study couples as a result of the more frequent and more involved interviewing" (p. 323). New EYM follow-up data collected by Veroff were analyzed by the author and summarized below.

Other Evidence. Several other researchers have also found support for the idea that panel studies involving respondent introspection may cause changes in well-being (Haight, 1992), attitudes (Sanford, 1965), and behaviors (e.g., Wilson & Dunn, 1986; Wilson, Dunn, Kraft, & Lisle, 1989), particularly when open-ended protocols are employed. In contrast, several studies of sexual attitudes have shown no effects on the sexual behavior of study participants over time (e.g.,

Halpern, Udry, & Suchindran, 1994). It may be that reactive insight effects are more likely to occur in studies with a high proportion of open-ended questions. Mishler (1986) describes the empowering quality of answering open-ended questions about self-relevant issues.

*Through their narratives people may be moved beyond the text to the possibilities of action. That is, to be empowered is not only to speak in one's own voice and to tell one's own story, but to apply the understanding arrived at to action in accord with one's own interests.* (Mishler, 1986, p. 119)

Summary of Prior Studies. Extant research suggests that reactive insight: (a) derives primarily from participation in research on sensitive topics or ones with personal relevance to the respondent, (b) influences standard survey measures of attitudes, and marital satisfaction and well-being, (c) increases relative to the use of open-ended and narrative styles of interviews, (d) increases through multiple assessments, (e) produces effects that may endure up to a year and longer, and (f) has the potential to generate both positive and negative effects.

Given the hundreds of studies that have been conducted and will be conducted on personal topics such as marriage, stress and coping, courtship, family life, mental health, and adjustment, it will be important to better understand reactive insight effects and its consequences for research methodology and measurement reliability, as well as ethical issues regarding research participation.

#### The 2001 Study of Reactive Insight Effects<sup>4</sup>

Reactive Insight effects were recently explored through analyses of new data from two panel studies: (a) the *Role Conflict and Coping Among Women Professionals* (Role Conflict) study, which began with a sample of women professionals (N=200, and 140 of their husbands) with preschool-age children; and (b) the *Early Years of Marriage* (EYM) study, which began with a representative sample of newly married couples (N=373) who had filed for marriage

<sup>4</sup>Further detail on the study methodology, results, and discussion appear in Laug (2002).

The Repercussions of Research Participation:  
Exploring Reactive Insight Effects (continued)

licenses in Wayne County, Michigan. Both studies are particularly relevant to investigations of reactive insight in that they included:

- longitudinal assessments — 5 waves of interviews over approximately 7-9 years;
- a rich variety of data on many of the following measures: satisfaction, stress, coping, health, functioning, and other conditions related to work, marriage, and parenting;
- information collected from respondents' spouses on measures such as, marital satisfaction and perceptions of their partner's satisfaction;
- specific closed-ended (both studies) and open-ended measures (Role Conflict study) of reactive insight;
- a longitudinal control group (EYM study) that received fewer and less intensive interviews than the main study group.

#### Select Findings and Speculation

When asked whether survey participation influenced feelings or behaviors related to their marriage, parenting, or work, 52% of Role Conflict study respondents answered "yes" and then gave open-ended elaborations, such as:

- *I didn't used to talk to myself to calm down. I started because you mentioned (in a question) about whether I talk to myself to cope.*
- *It's made me think about issues that came up in the surveys. It's made [my husband and me] talk about it, like our relationship. It's brought up issues to discuss. For example, our expectations of each other. It made me realize that he does more than I thought [he did] to help out.*
- *I've begun to set limits on my job with the feeling that it was OK to do that.*
- *It's brought to life how dissatisfied I am with my job.*
- *I never thought before about what I'd do differently. I realized my career is very important to me and that I wouldn't marry or have kids if I could do it over.*

- *I've tried to look at the stress and see what I can delegate. I tend not to recognize stress and this [study] has made me more aware of it and now I take some action.*
- *Helps me prioritize work within my life. My children are much more important than work.*
- *I began walking and jogging for exercise.*
- *It's kind of hard to bury your head in the sand and ignore problems when you have to answer these questions.*
- *I think this survey made [me] realize that you can't be a super-mom and have or do it all. Compromises are needed between husband, wife, and kids to get things done.*
- *[Participating in the study] convinced my husband to help more with the children.*
- *My husband and I separated in 1991 and divorced July 1992.*

Across both studies (Role Conflict and EYM), results of content analyses and multivariate tests suggested a number of conclusions and future directions including:

1. Self-reported reactive insight appraisals range from positive and beneficial to negative and stressful, but more often are positive.
2. Reactive insight may increase communication between partners but, potentially, at the cost of increased interpersonal friction.
3. Although the self-reported appraisals can be rich and moving, it is not yet clear how they related to changes in more objective assessments of satisfaction, well-being, and health.
4. Using random assignment to a control group, which gets less frequent and less intense research exposure than a study group, appears to be more effective than self-reports of reactivity for isolating reactive insight effects.
5. Larger studies are needed — perhaps adding control groups to national sample studies — to uncover the characteristics of respondents and research designs that cause or relate to reactive insight effects.
6. The potentially negative effects of reactive insight need to be better understood so that researchers can design studies to minimize such effects, include appropriate informed consent agreements, and be prepared to assist distressed subjects.



7. It may eventually be possible to reliably measure the effects of reactive insight on key dependent measures and then to statistically correct those measures to enhance the accuracy and representativeness of study findings.

Although not entirely testable in the current studies, reactive insight appears to be a product of the following research design and participant factors:

Design features that may facilitate reactive insight

- Research participation frequency
- Issue coverage (breadth of stimulating items)
- Narrative/open-ended response opportunities
- Issue relevance (as defined by the participant)

Participant features that may facilitate reactive insight

- Introspective skill (ability to recognize and interpret self-relevant information)
- Motivation for discovering self-relevant information

Ethical Issues. With respect to ethical issues, of the 50%-80% of respondents (across studies previously described) who report effects of research participation, the majority (around 90%) report positive effects and show increases in measured satisfaction. Although only 3%-12% of respondents report negative effects, distress, or lower satisfaction scores, ethical guidelines for both the American Psychological Association (APA) and the American Sociological Association (ASA) clearly state that researchers must "take steps to implement protections for the rights and welfare of research participants and other persons affected by the research" (APA, 1992, 6.06d). Furthermore, "where research procedures result in undesirable consequences for the individual participant, the investigator has the responsibility to detect and remove or correct these consequences, including long-term effects" (APA, 1990, p. 395).

Because research on reactive insight suggests that certain study respondents may be subject to unintended emotional effects, there is an increased

ethical burden or responsibility on the researcher to assess reactive insight effects and to have clinically appropriate resources available for respondents who may need them. In other words, when human subjects are involved, social science and health researchers should be prepared to deal with unintended sensitive disclosures and clinical reactions (for a fuller discussion, see Bersoff and Bersoff, 2000).

Measurement Issues. With respect to research methodology and measurement, it is a significant scientific problem when the act of measurement distorts the validity and representativeness of one or more assessed values. Bradbury (1994) notes, "studies are needed to identify which individuals, which marriages, and which research procedures are associated with negative reactions to participation" (p. 199). Such research should build on the wealth of scientific evidence available on cognitive and contextual effects on respondents' answers (e.g., Schwartz, 1999, and Tourangeau, Rips, & Rasinski, 2000). Thus, to improve social science research, these issues will require a detailed empirical examination of a full range of individual, situational, and methodological aspects of reactive insight.

Next Step. More communication is needed among researchers to discuss reactive insight effects that may be occurring in their studies, and to design better methods to uncover and address reactive insight effects in the future. Readers who are interested in this area are invited to communicate directly with the author at [Eric@Prosocial.com](mailto:Eric@Prosocial.com).

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What you measure improves.

Donald H. Rumsfeld  
Secretary of Defense



## What's the big deal about bullying?

*Missy Fleming and Fred Bryant*

Americans seem to have a short attention span when confronting complex social issues; we prefer simple solutions to knotty problems despite contrary evidence. However, careful, systematic assessment is a necessary step in the process of logical problem-solving. Slighting the assessment phase can create solutions that become problems in themselves and further obfuscate understanding the original situation. Addressing youth bullying, a specific type of aggressive behavior, necessitates reliance on appropriate assessment to enhance understanding and identify reasonable solutions.

For years now, researchers and educators have been trying to get us to share their concerns about young people's aggressive peer interactions. However, our culture still tolerates bullying as a rite of passage for male aggressors to enjoy and victims to endure. Aggressive girls are considered dominant "alpha" adolescents who rule like queen bees. Through acts of omission and commission, we subtly condone these behaviors, while considering victims' reports to authority figures as a sign of weakness.

Until adolescent school shooters in the late 1990s gave this country a wake-up call, very few people were paying attention. Our current response to this situation is to build more prisons, use metal detectors at schools, and prosecute juveniles as adults. We blame the victims by referring to boys as "urban predators" and girls as "wannabe witches" who are just trying to assert themselves. No one deserves to be bullied, and young people's reports of relentless taunting and teasing should be taken seriously. Recent research has discovered some facts about bullying and has identified situations in which bullying occurs.

What constitutes bullying? Bullying involves a pattern of repeated aggression that features a deliberate intent to harm or disturb a victim without regard for that person's distress. Bullying is a form of conduct disorder, a psychiatric diagnosis that involves violating the basic rights of others and challenges social norms that are age-appropriate (American Psychiatric Association, 2000). Although most people think of bullying as physical, it can also be verbal or nonverbal.

What's the extent of the problem? According to studies of young people in the United States, 17% of children attending grades 6 through 10 report having been bullied, and 19% report that they have bullied others (Nansel et al., 2001). Other researchers who interviewed rural youngsters in grades 4 through 6 found that 23% reported having had a recent bullying experience and 9% reported bullying others at least once a week (Melton et al., 1998).

Who are the bullies? Both boys and girls are guilty. Research suggests that boys are bullied primarily by other boys, whereas girls are bullied by both other girls and sometimes boys. Although boys are more likely to report physical bullying experiences, girls are more likely to report verbal and nonverbal forms of bullying (Nansel et al., 2001).

So, how do people get to be bullies? Bullies probably are made not born and their behavior is likely to begin at home. Research has associated bullying behavior with families that use physical discipline (Esplade, Bosworth, & Simon, 2000). In some families, children learn that aggression can help them get what they want and get things done. In this way, bullying shares several characteristics with child maltreatment and domestic violence (Limber, 2002).

Where does bullying happen? Bullying can take place anywhere, but schools are problem sites because kids are there and are often crowded. Some school climates tolerate physical and relationship aggression, especially by popular athletes and wealthy elites. Researchers who investigated school shootings found that the shooters described themselves as being persecuted or threatened by other students and that they were twice as likely as their homicide victims to have been targets of bullies (Dedman, 2000; Melor et al., 2001).

What's the harm in bullying? Bullying behaviors have consequences for both the bully and the victim. According to one study (Nansel et al., 2001), young people who are bullies or victims of bullies are more likely to demonstrate poorer psychosocial adjustment, compared to youth who are not involved in bullying; and alcohol use is positively linked to bullying, while smoking and poor academic achievement are linked to both

## What's the big deal about bullying (continued)

bullying and being bullied. Longitudinal studies of boys have found that bullies are three to four times as likely as their nonbullying peers to have multiple legal convictions by their early 20s (Olweus, 1993). Victims of bullying can suffer long-term psychological consequences and endure real, physical distress.

How are we assessing bullying behavior? Researchers have devised a variety of ways to measure bullying that use different methods of assessment. Available measures of bullying include single items taken from a larger instrument assessing a broader, higher-order construct, such as early loss (Burton & Topham, 1997), conduct disorder (Sonuga-Barke & Balding, 1993), or psychiatric symptoms (Achenbach & Edelbrock, 1979); multiitem self reports designed to assess multiple dimensions of bullying, such as feelings of safety from bullying at school, reasons for not intervening to help a child being bullied, and self-reported school absenteeism (Slee, 1994); multiitem parent reports of child behaviors (Quay & Peterson, 1996); multiitem teacher reports of student behaviors (Price & Dodge, 1989); combined indices of mother and child reports (Kasen, Cohen, & Brook, 1998); and even coding schemes for making direct, nonreactive observations of actual bullying behavior in naturalistic settings, such as during free-play sessions at school (Price & Dodge, 1989).

The measurement of bullying is particularly challenging because instruments must not only be sensitive, valid, and reliable, but must also be non-threatening, multifaceted, and age- and culture-appropriate. Although the menu of available instruments offers some choices, more psychometric work is needed to explicate the conceptual similarities and differences among these alternative measures.

What's the lesson to be learned? Both bullies and victims have a great deal to teach us. First, we need to measure their behavior and assess its impact on their lives. Second, we need to intervene with families that use aggression as a strategy for solving problems. These families need psychological, social, and financial assistance to break the cycle of domestic violence. Third, we

need to change our social norms by challenging aggression as a solution to interpersonal difficulties. Bullies' strong self-esteem is reinforced when their aggression continues to give them what they want. Bullies can develop empathy for others by learning new coping strategies and finding more adaptive ways to solve interpersonal problems. However, peer mediation is not one of these solutions — victims live in fear of confronting their aggressors, and encountering one another can exacerbate the situation. Fourth, we need to create a climate in which bullying is not tolerated anywhere in our communities, and we need to encourage and support the reporting of victimization.

Accepting physical appearance, wealth, and status as the criteria for determining winners and losers subtly reinforces interpersonal aggression. Challenging these cultural norms is no small task, because we must intervene with young people who interact positively only with other bullies and who are reinforced for their aggression. Tolerating bullying behaviors leaves both bullies and their victims in the wake of aggression. Americans are up to this challenge; but we need to think long and hard about why we tend to cheer bullies as heroes and disdain our stereotypic victims as weak and inconsequential.

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## The Vital Importance of Measurement in High-Altitude Mountaineering

*Fred B. Bryant*

Measurement is essential to scientific research in the natural and social sciences, driving the evolution of theory and advancement of knowledge. Measurement also is crucial in countless human endeavors other than research. Measurement is essential to practice, as well as research, in fields from a to z, from art preservation to zoo-keeping, accounting to zinc-mining, architecture to zinnia-growing. In fact, it is difficult to think of any human pursuit that does not rely in some way on measurement.

The high-stakes world of high-altitude mountaineering is no exception. Both physical safety and ultimate success are dependent on computations involving measures of, for example, time and distance, and on analysis and interpretation of data generated through measurement, as in weather forecasting. The purpose of this article is to highlight the vital importance measurement plays in mountain climbing by briefly describing some of the ways in which mountaineering depends on measurement.

The need for valid, reliable measurement in mountain climbing is illustrated in the following vignettes:

- A climber breathing supplemental oxygen surveys the final stretch to the summit: Is there enough oxygen left in the bottle to reach the top and return, or should he carry another full bottle with him to the top? In 1953, Sir Edmund Hillary faced such a decision during his first ascent of Everest. Before tackling the final summit ridge, he performed the necessary computations in his head involving measures of flow-rate, time and distance, and then correctly concluded that he had enough oxygen left (Hunt, 1953). (Interestingly, the

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High-Altitude Mountaineering (continued)

day before Hillary's historic first ascent with Sherpa Tenzing Norgay, two other climbers, whose names — Tom Bourdillon and Charles Evans — history has forgotten, became the first men to reach the final summit ridge, where they decided to turn back, given the time, distance, and oxygen supply remaining.)

- A climber approaches the summit late in the day: Is there enough sunlight left to reach the top and still get back to the highest camp, or should he turn back now? Mistakes in timing have forced climbers to bivouac overnight in the Death Zone (above 8000 meters), risking hypothermia, frostbite, or worse, as in 1978 when American Jim Wickwire barely survived an unprotected bivouac near the summit of K2 (8611 meters), the world's second highest mountain (Ridgeway, 1980).
- A raging blizzard hits a high camp: Is there enough food and fuel left, or should the climbers descend and resupply? Miscalculations have cost climbers' lives, for example, the deaths of seven experienced climbers in 1986 after reaching the summit of K2 when they had mistakenly failed to resupply (Curran, 1987).

As shown in the vignettes above, when making the kinds of life-and-death decisions prevalent in high-altitude mountaineering, errors in measurement or in the use of measurements can be disastrous. Clearly, then, accurate measurement, proper analysis, and the exercise of good judgment together can spell the difference between a thrilling, rewarding adventure and the ultimate nightmare.

From initial planning to the final climb, valid and reliable measurement is essential in climbing the world's tallest mountains, known collectively as "the 8000ers," 14 Himalayan peaks that rise above 8000 meters (Everest at 8848 meters is the highest). In scaling the 8000ers, climbers rely on accurate measurement to help them safely negotiate the dangers of high altitudes.

The traditional approach to climbing 8000ers is a large-scale expedition involving dozens of

climbers, hundreds of porters, and many tons of supplies. To be successful, expeditions require careful planning, safe and efficient stockpiling of camps at consecutively higher altitudes, and good luck with the weather. Expedition planning thus requires accurate measurement of relevant variables, for death is the ultimate consequence of underestimating the amounts of food, fuel and equipment needed, improperly placing and stockpiling camps, or poor weather forecasting.

Of course, measurement data must be analyzed to yield meaningful information. Then that information must be interpreted. Furthermore, both data and information must be transmitted in a timely fashion to and from the base camp and between the base camp and remote technical support teams. Thus, state-of-the-art electronic technologies are increasingly being used to analyze and communicate data. For example, some expedition planners, like the British on Everest's Southwest Face in 1975 (Bonington, 1976) use statistical software to compare projected outcomes of alternative solutions to specific logistical problems in deciding when to move what supplies where. Once on the mountain, expeditions like the 1990 Joint American-Chinese-Russian Peace climb on Everest (Whittaker, 1994) rely on computer-telecommunication links to transfer and analyze updated weather forecast data in making decisions about the movement of personnel.

A bolder, modern-day alternative to the traditional expedition approach to mountaineering is alpine-style climbing. This approach involves only 1-3 climbers who pit themselves against the mountain, lugging all essential supplies with them as they climb, relying on speed to minimize exposure to risks (Messner, 1990). In this approach, climbers trade off (a) the security of support personnel, stockpiled camps, and a "fixed" ascent route for (b) lightness and quickness on the mountain, and greater challenge. Analyses of Himalayan climbing data through 1985 indicate that climbers in expeditions run a 1 in 30 chance of being killed trying to climb an 8000er (Messner, 1988). In alpine-style climbing, on the other hand, the death rate may be closer to 1 in 3 (Child, 1993). This tenfold increase in risk makes trustworthy measurement and data analysis all the more crucial in alpine-style climbing.

In addition, given the need for speed in alpine-style climbing, rapid and accurate transmission of data are absolutely essential. Accordingly, some alpine-style climbers wear telecommunication equipment while climbing so as to receive a constant stream of vital, real-time information from their base camp concerning location, progress, physical conditions, and weather changes, just as an astronaut on the moon uses data relayed from Mission Control back on earth. In 1988, for example, Frenchman Marc Batard relied on information transmitted from observers at base camp to guide him during his 22 1/2-hour solo speed-climb of Everest without supplemental oxygen (Tabin, 1993).

In the final analysis, however, regardless of which climbing approach is employed — expedition-style or alpine-style, success or failure on the 8000ers ultimately depends on the soundness of the climber's judgment in the face of imminent risks. Wise decision-making is vital when flirting with the dangerous mixture of bad weather, oxygen deprivation and dehydration found at high altitudes. Faced with an approaching storm, for example, is it better to turn back or to continue climbing toward the top? Climbers must gauge how fast the storm is approaching, how long it will take them to reach the summit, and where they are in relation to the nearest camp. Each of these judgments involves measurement, data analysis and interpretation, requiring both logic and judgment. Yet at high altitudes, perceptual and cognitive abilities, logical thinking and rational decision-making may be impaired.

Because a mistake in judgment may be their last, climbers stake their lives on accurate measuring instruments that produce valid, reliable data. Instruments such as a compass, altimeter, watch (with built-in calculator), and topographic maps provide climbers with vital information about distance, direction, speed, and weather-related changes in barometric pressure. Some climbers even carry a GPS (Globe Positioning System) communication device for instant satellite verification of position. Nonetheless, mistakes are made. False readings or mistaken inferences (among other things) can be fatal, as when six climbers died in a storm on Mount Everest in 1996

as a result of underestimating the severity of approaching weather (Krakauer, 1997). Compounding the problem, oxygen deprivation clouds perceptual judgment at high altitude, making higher-order assessments and comparisons more difficult, and thus less valid and reliable (Houston, 1980).

It is indeed ironic that climbers are most dependent on their ability to make critical distinctions at the very times when they are least capable of doing so. To improve the soundness of judgments, climbers often resort to seeking group consensus in making and interpreting measurements at high altitude, though such pooling of opinions can produce misleading conclusions if all co-participants share the same bias (Peters, 1982). Thus, just as in the social and behavioral sciences, error and bias in measurement are to be avoided in high-altitude mountaineering. But, unlike social scientists, mountaineers may not get a second chance to get it right.

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**The Vital Importance of Measurement in High-Altitude Mountaineering (continued)**

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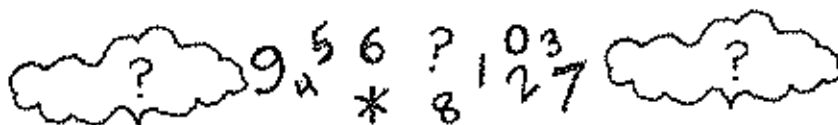
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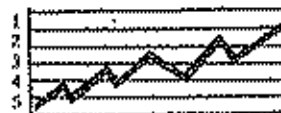
## HaPI Thoughts



When you can measure what you are speaking about, and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science.

William Thomson, Lord Kelvin  
1824-1907

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