Principle of Regression to the Mean

Regression to the Mean is a statistical phenomenon that describes the tendency of both outstanding and poor performances to be pulled toward the mean (average) in subsequent events.

Kahneman (2011) notes that there is strong research evidence for the conclusion: "Rewards for improved performance work better than punishments for mistakes. "Yet many managers have witnessed the opposite phenomenon: "After a truly stellar employee performance reinforced with praise and positive support, the next performance shows a decline. Further, after a dismal performance, employees who confront harsh criticism and negative sanctions, usually have improvement in their next performance. This may lead practitioners to the *clear*, *but incorrect conclusion*: Punishment and negative sanctions for mistakes work better than rewards and positive support for outstanding performance."

Kahneman provides a concrete example from a class he taught for aviators. He explained that the research was clear; **rewards work better than punishment to improve performance**. A seasoned aircraft instructor with practical experience, however, took exception and exhorted: "On many occasions, I have praised flight cadets for a clean execution of some aerobatic maneuver. The next time they try the same maneuver, they usually do worse. On the other hand, I have often screamed into a cadet's earphone for bad execution, and in general, he does better on the next try. So please don't tell me that rewards work and punishment does not because the opposite in true" (Kahneman, 2011, 175). These results of pilots in training are better explained by regression to the mean rather than by the effectiveness of a supervisory style.

It should not be surprising to learn that luck, or more precisely random fluctuations in the quality of performance, is a force that pulls performance level toward the mean (average performance). Of course, talent and expertise are important in performance. But never underestimate the role of luck in the equation of success, but then again, don't depend on luck because it is fickle and random. You are just as apt to be unlucky as lucky.

The normal distribution is a bell-shaped curve that is drawn in most statistics books to describe random fluctuations in the distribution of events or scores. For example, imagine a shallow box set on its end with a transparent front side. In that box, every inch or so, just big enough for a Ping-Pong ball to pass through, there is a dowel. The box would create a three-dimensional lattice. Now imagine some mechanism dropping balls into the middle of the box from the same point above. Experiments show that these balls will distribute themselves normally. Most of the balls will cluster around the middle, but occasionally a ball will bounce way out on one extreme and eventually another ball will bounce way out in the other extreme.

Given enough balls, the pattern becomes clear; it is a random distribution. In statistical terms, 64% of the balls will cluster around the middle, within 1 standard deviation above and below the mean; 92% within 2 standard deviations above and below the mean; and most of the remaining balls will be within 3 standard deviations above and below the mean. Very rarely, however, a ball will bounce out four or five standard deviations above the mean (very lucky or unlucky if the ball goes in the other direction). The purpose of this example is to illustrate the fact that randomness has a distinct pattern. As a young person, I saw this demonstration at an IBM booth at the World's Fair in New York City. It was not until I studied statistics nearly two decades later that I understood fully random distribution and its significance.

In brief, *regression to the mean is the tendency of random events to cluster around the mean.* An outstanding performance whether in flying, golfing, fishing, testing (scoring high on a test), or a bouncing Ping-Pong ball is likely be followed by a less outstanding performance as chance pulls results toward the mean, that is, as scores regress toward the mean. Whenever the correlation between two scores is not perfect (1), regression to the mean exists. If you become the principal of the worst school in the state as measured by standardized state tests, you can be confident the test scores will rise the next year simply because of regression to the mean. Therefore, it is likely you have at least a year or so to get your program for change in place. Don't boast too much about your first-year results. It is the second- and third-year results that will show the merit of your changes and leadership.

Our minds are developed to think associatively, that is, when we encounter an outcome, we hunt for a cause. In fact, we tend to think of causes already stored in our memory. The problem with "regression toward the mean" is that casual explanations are offered to explain regression when in fact "regression to the mean" has an explanation, but it does not have a cause." (Kahneman, 2011, 182).

One final caveat from Kahneman--If you are a lawyer and winning your case depends on explaining the meaning of regression to the mean to a jury or judge, you will lose.