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Rapid Technique Correction Using Old Way/New Way: Two Case Studies With Olympic Athletes

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Exploratory studies examine the effectiveness of old way/new way, an innovative meta-cognitive learning strategy initially developed in education settings, in the rapid and permanent correction of established technique difficulties experienced by two Olympic athletes in javelin and sprinting. Individualized interventions included video-assisted error analysis, step-wise enhancement of kinesthetic awareness, reactivation of the error memory, discrimination, and generalization of the correct movement pattern. Self-reports, coach's ratings, and video recordings were used as measures of technique improvement. A single learning trial produced immediate and permanent technique improvement (80% or higher correct action) and full transfer of learning, without the need for the customary adaptation period. Findings are consistent with the performance enhancement effects of old way/new way demonstrated experimentally in nonsport settings.

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The quest for continuous improvement in athletic performance is threatened when an athlete appears to lose the competitive edge and falls into a slump. What was perfectly good technique, refined over years of hard work, appears to be lost. In its place is a consistent, learned error that is automated, unintentional, and resistant to correction (Crampton & Adams, 1995; Davis, 1991; Maschette, 1985; Pyke, 1980; Tutko & Richards, 1971). Recovery from a performance slump is typically prolonged, frustrating, and destructive of self-confidence (Collins, Morriss & Trower, 1999). The usual coaching advice, to increase skill drills, be persistent, and accept that old habits die hard (Davis, 1991), though well intentioned, is usually not helpful.

The role of psychological skills training in coping with competition stressors and improving performance is well documented in sport psychology (Hanin, 1986, 1989, 1999; Singer, 1988; Singer, Lidor, & Cauraugh, 1993). A less researched area of practical experience is the correction of established technique problems responsible for slumps and poor performance during major competitions of the season.

This paper approaches sport performance difficulties from the theoretical and practical perspective of old way/new way (Lyndon, 1989, 2000). Old way/new way comprises a novel synthesis and interpretation of both established and newly emerging learning concepts and principles. These include the role of automaticity in learning and behavior (Bargh & Chartrand, 1999), the concept of learned errors (Reason, 1990), the impact of prior learning on attempts to learn new skills (Ausubel, 1968), the value of metacognitive strategies for enhancing learning (Flavell, 1987), and proactive inhibitory interference and accelerated forgetting (Underwood, 1957, 1966). Additionally, several assumptions of the individual zones of optimal functioning (IZOF) model were used regarding the athlete's awareness of erroneous and correct movement patterns and related emotional states (Hanin, 1997, 2000).

Learned errors, sometimes called skill-based errors, overlearned errors, habit intrusion errors, recurrent errors, or expert errors are among the most common of all error forms in human learning (Reason, 1990). Interference with skilled performance from learned errors in performance in sport and associated reversion to old erroneous ways has been documented in a wide range of sporting activities involving elite athletes as well as beginners. The list includes discus (Watts, 1988), javelin (Lawler, 1996; Collins et al., 1999), shot put (Grigalka, 1981), high jump (Stirzhak, 1988), running (Dickson, 1994), soccer (Crampton & Adams, 1995), cricket (Davis, 1991), hurdling (McFarlane, 1990), and in coaching (Maschette, 1985; Davis, 1991; Crampton & Adams, 1995). Performance inhibiting learned errors also play both cause and effect roles in overuse and sports injuries (Macchi & Crossman, 1996) and in postural problems of athletes (Gieck, Foreman, & Saliba, 1989).

The coaching literature places great emphasis on "getting it right the first time" (Grigalka, 1981; i.e., on an error prevention strategy.). Coaches and athletes know that when a technique error is allowed to go on uncorrected, it progresses, through practice, to the autonomous stage of performance (Bargh & Chartrand, 1999; Pyke, 1980) at which point it becomes a learned error or bad habit and is then much harder to eradicate because it is no longer under conscious control. However, despite quality coaching and motivated athletes, coaches inevitably end up spending a lot of their time trying to help athletes correct poor technique.

Technique faults have many causes. The athlete does not even have to be doing something wrong before a change in technique becomes necessary. Sport is

just as vulnerable to the winds of change as any other human endeavor. For example, a change in equipment (Study 1, this paper), rule changes (Crampton and Adams, 1995), a different coach or coaching routine (Tutko & Richards, 1971), self imposed change (Watts, 1988), and transitioning from one sport to another can suddenly present major problems for an athlete. What was perfectly correct and best practice one day becomes unacceptable and wrong the next. The better someone has learned the original routine or actions in the first place, the harder it is to change over to the new way (Lawler, 1996; Watts, 1988). During the period of adaptation to the new way, performance drops and errors increase (Maschette, 1985; Watts, 1988).

Conventional skill correction methods involve pointing out the error, increasing self-awareness, and then emphasizing practice of the correct skill or technique. This time-honored approach is based on the assumption that the athlete, for one reason or another, did not learn from the original coaching and drill sessions, so reteaching of the skill is necessary. Reteaching follows a familiar and predictable pattern (Maschette, 1985):

1. Explain what the athlete is doing wrong and explain why it is wrong.
2. Improve the athlete's awareness of what he or she is doing wrong.
3. Show or model the right way and explain why this way is better.
4. Ask the athlete to copy it.
5. Provide corrective feedback and reinforcement.
6. Get the athlete to practice, practice, and practice.

Almost all current methods of technique correction and skill development used by coaches rely on skill drills (i.e., practice or repetition of the right way) in athletics (Tutko & Richards, 1971), javelin (Maximov, 1974), coaching (Pyke, 1980), shot put (Grigalka, 1981), basketball (Young, 1985), discus (Watts, 1988), high jump (Stirzhak, 1988), swimming (Killmier, 1990), cricket (Davis, 1991), wrestling (Sherman, 1991), and in goal kicking (Taylor & Nunez-Bentz, 1992).

Skill drills and other forms of deliberate practice involving repetition and successive refinement (Ericsson & Lehmann, 1996) are known to be strongly associated with athletic performance (Ericsson, Krampe, & Tesch-Romer, 1993). However, although practice is valuable and necessary for learning a new skill, experience confirms that practice, when done in the same way as with the learning of a new skill, is much less useful when trying to change or improve an existing, well practiced, and automated skill.

Practicing the right technique in the face of an established technique error is usually slow to show results, time consuming, resource draining, and largely unsuccessful (Davis, 1991), yet coaches and athletes persist with it because there are few really practical alternatives. Correction methodologies that do produce worthwhile results, such as behavioral approaches to coaching (Allison & Ayllon, 1980; Martin & Lumsden, 1987; Sherman & Rushall, 1993), are often complicated, time and resource intensive, not user friendly, and difficult for all but highly trained practitioners to successfully implement (Stallings, 1982).

The impact of learned errors in sport is that despite quality coaching and prolonged, intensive, and highly motivated training, there is often a poor transfer of learning from skill drills (the standard remedy for overcoming learning errors) to competitive performance. Athletes often seem to improve during training and skill drills, but they become confused, make errors, and appear to forget what they

have learned when left to their own devices, as in hard training and in the heat of competition. They repeatedly fall back to their old incorrect ways and fail to improve or improve only very slowly (Maschette, 1985; Young, 1985). Consequently, the adaptation period to a new technique or new skill is often greatly prolonged, and during this period, errors increase and the athlete becomes frustrated and demoralized. Clearly, the coaching world needs a better theory and a more effective method of skill development and correction.

Lyndon (1989, 2000), in a novel synthesis and interpretation of well-researched and accepted psychological learning principles, has produced an explanation of why habitual errors in conceptual understanding and skilled performance are so difficult to eradicate. He also offered a method for overcoming this problem.

1. Given that repetition of a behavior is a sign that learning has occurred, consistent, habitual errors indicate the presence, rather than the absence, of learning. In this case, what the person knows is how to do it "wrong."
2. When new knowledge or a new skill disagrees or conflicts with what a person already knows, this conflict generates proactive inhibition (Underwood, 1957, 1966), which causes accelerated forgetting (Underwood, 1966) of the new information the person is trying to learn.
3. Proactive inhibition (PI) does not prevent learning from occurring; it merely prevents the association of conflicting ideas (Underwood, 1966).
4. It does not matter whether what the person already knows is correct or incorrect, because PI protects all prior knowledge and does not discriminate between what is "right" and what is "wrong" in a given context.
5. PI, therefore, exerts a maintenance effect over prior learning, inhibiting change and preserving erroneous (as well as correct) knowledge and skills.
6. PI is a universal and involuntary mechanism over which one has little or no control.
7. There appears to be considerable variation within the population in the level of PI one inherits (Stroop, 1935). Individuals with higher PI are less likely to achieve successful behavior change (e.g. error or skill correction, habit reversal) under conventional correction methods.
8. Performance becomes cue dependent, and the individual reverts to prior behavior patterns when the coach's, trainer's, or instructor's presence is withdrawn, thus inhibiting transfer of learning to other settings (Postman & Gray, 1977; Miller, Kasprow, & Schachtman, 1986) and ensuring that the erroneous knowledge and behavior continue to resist correction.

Studies of proactive inhibitory effects on skill acquisition in sport are scarce, but the available research (Eason, Smith, & Plaisance, 1989) confirms the powerful effect of proactive interference observed in nonsport motor skills (Lewis, Smith, & McAllister, 1952; Warren, 1974). Some theoretical support for the notion of acknowledging and incorporating errors in skill learning comes from other studies in the enhancement of sport performance:

1. Holding (1965) recommended that learners practice "alternative response patterns" in order to distinguish the difference between correct and incorrect responses from the feedback they got.
2. Schmidt (1977) claimed that errors are not negative aspects of performance but can strengthen motor learning because they help define the limits of acceptable performance.

3. Kerr and Booth (1977) found that accuracy of ball throwing was improved by practicing "short" and "long" throws as well as "on target" throws.
4. Sharp (1988), picking up on the notion of "negative practice" (Dunlap, 1932), acknowledged that practicing wrong movements could be useful because it clarified the difference between a good and a bad performance, but this strategy was likely to be useful only as long as the performer was aware that an "error" was being made.
5. Cesari and Milanese (1995) described the use of deliberate exaggeration of the performance error to assist skill correction in tennis.
6. Collins et al. (1999) reported beneficial effects from the use of "contrast drills" in which the athlete performed the action in the "right" way followed by performance of the "wrong" way.

The vast amount of literature on behavior change, particularly in the fields of education, management, psychology, and the enhancement of skilled performance indicates an awareness of the challenge posed by learned errors with their associated transfer of learning problem. However, the available research offers few effective and practical solutions for dealing with these profound and universal learning obstacles. Old way/new way (Lyndon, 1989, 2000) offers a means to address this problem.

Old way/new way protocols are prepared prior to an intervention, called a learning trial, and are tailor made for a specific performance difficulty or conceptual misunderstanding where change is required. Because no two performance situations are exactly alike, the old way/new way practitioner needs to be thoroughly grounded in the theory and practice of this learning methodology in order to diagnose each performance problem and design an appropriate and effective old way/new way intervention.

Experimental studies of the effectiveness of old way/new way in human performance settings other than sport and the results of numerous field trials (Baxter & Dole, 1990; Baxter, Lyndon, & Dole, 1999; Dawson & Lyndon, 1997; Dole, 1992, 1993; Lyndon, 1989, 2000; Lyndon & Dawson, 1995; Rowell, Dawson, & Lyndon, 1990) consistently report that after one successful correction session, the person has an 80% or higher probability of performing in the new way, a 20% probability of performing in the old way, and has a 90% probability of self-detecting an old way when it occurs and then self-correcting it. Spontaneous recovery (Underwood, 1966) of the old way can be expected at two to three weeks after the original learning trial and is easily handled.

Although considerable anecdotal evidence is available in the form of accelerated learning and improved affect attributed to old way/new way by sport psychologists and sports coaches, little if any of this work has been documented. The aim of this exploratory study was to determine whether old way/new way would also be effective in skill correction with Olympic level athletes who were experiencing technique problems.

Method

Case studies were conducted with two Olympic level track and field athletes, namely a javelin thrower and a sprinter.

Participants

Selection of athletes and their technique problems for this study was done by the first author and was governed by certain requirements. The main requirement for selection was that the athlete was in a performance slump, was uncompetitive, or becoming so, and was experiencing a performance difficulty that (a) involved an established technique problem, (b) was well established (i.e., consistent and predictable), (c) was unresponsive to all previous correction attempts involving quality coaching, and (d) was an ongoing source of frustration for both athlete and coach. Clearly, these characteristics are shared by most serious sport performance difficulties. The Olympic athletes selected to participate were a 25-year-old female javelin thrower and a female sprinter aged 19.

Measures

Measures used in each case study included the following:

1. A detailed error analysis by athlete and coach used to produce an action based description of erroneous and correct movement sequences, drawing on video assisted recall of past performance
2. Observation of the behavioral, performance, and emotional responses of the athlete during the old way/new way learning trial
3. Transcribed audio tape recordings of the athlete's self-reports during the learning trial
4. Recorded post-performance feedback from coach and athlete in follow up sessions

Procedure

In both case studies, a standardized, cooperative, team-based intervention process included the following steps:

1. The first author, trained in old way/new way interventions, contacted coach and athlete and explained the potential benefits of old way/new way in dealing with a performance slump.
2. When agreement and interest was obtained, athlete and coach, prior to the skill correction session, prepared a detailed error analysis of the technique difficulty.
3. An individualized old way/new way protocol for correcting the athlete's technique problem was devised by the fourth author, the old way/new way trainer, adapted from the protocol outlined by Lyndon (1989) for use in educational settings.
4. After feedback from the other team members, this protocol was implemented in a single old way/new way learning trial with the athlete, lasting from one to two hours, including a warm-up period.
5. The athlete underwent the learning trial, which was conducted by the first author with the assistance of the athlete's coach.
6. The first author conducted debriefing and prescribed follow-up strategies and activities designed to enhance learning and to deal with spontaneous recovery of the error.
7. A review of progress was conducted two weeks after the learning trial.

In the sections that follow, each case study is described in detail, followed by a general discussion of findings.

Case Study 1: An Olympic Level Javelin Thrower (M)

Background to the Technique Difficulty

The 1999 season was a difficult one for M. She suffered from injuries, a new type of javelin was introduced, and she experienced consistent errors in technique mainly during competitions. At the beginning of the season, M did not react to this error at all because she was not even aware that she had a technique problem. However, once her coach pointed out the error, M began to pay more attention to it. She was able to compare this incorrect technique with her previous throws using video playback, and during practice, the technique problem appeared to be resolved.

Everything appeared to be going well for six months, but with the start of the summer competition season, the technique problem became more evident and serious with the introduction of a new javelin. M tried stronger throws and felt more pain in her shoulder, and the results were clearly below her potential and previous performances. Most of her throws were 7 m short of her personal best.

During training and practice, M was able to throw correctly almost every time, giving the impression that corrective coaching had produced the desired improvement. However, under the stress of competition, she would invariably fall back to her incorrect technique. The technique problem was causing underperformance and considerable pain in M's shoulder that could potentially develop into a serious (season-ending) injury.

Two months of skill correction and drills failed to improve the situation, and the World Championship in Seville was only three weeks away, so at the first author's suggestion, M's coach agreed to try old way/new way. In the sections that follow, a detailed description of the old way/new way session will be given, splitting the procedure into pre-, mid- and postintervention (learning trial) stages.

Stage 1. Prelearning Trial Stage

Motivation to Change. Getting the athlete's agreement to participate in old way/new way is an important first step, as it is with any skill correction program. A sport psychologist and a coach cannot change the athlete; she must make the change herself. Although a strong belief in the methodology is not a prerequisite, at least some degree of commitment to change and improvement is required. At the first author's request, M's coach had a preliminary discussion with her and, as expected, she expressed some doubts as to whether she should change her old way of throwing.

Her e-mail messages to the first author reveal two important aspects: (a) M's hidden resistance to change and that, as her coach said, they never really tried to correct the technique before because there was no problem during training and hence no real need to change anything; and (b) the consistent error in technique appeared only during a run-up with full speed and during the stress of competition.

Subsequent correspondence between M and the first author revealed that her unstable performance and the reoccurrence of the error, especially in competitions, had made her ambivalent about the need for correction. When everything

was going well, she saw no need to change, but the recollection of problems during competition gave her the feeling that she would like to do something about it. Her uncertainty and indecision were still apparent in her e-mail messages.

At this stage, M appeared highly motivated and optimistic and was clearly improving during training. However, the technique problem was still not under control. M's coach was ready for an old way/new way learning trial, but with the recent improvement in M's psychological state and in her general attitude, it was jointly decided to postpone technique correction until after the National competition. M knew her optimal performance state (Hanin, 1997) and was able to mobilize at the right moment, thus compensating for her suboptimal technique. Even more importantly, she had qualified to go to the World Championships.

After the Nationals, however, it was still obvious that M's throwing technique was too forced and had caused the injury to her elbow, so M and her coach made an appointment with the first author to commence old way/new way technique correction. The aim of the skill correction was to help M return to the better technique she had employed during the previous season.

Error Analysis. Old way/new way requires a detailed understanding and description of the technique fault. Three questions have to be answered: What is she doing wrong? What should she be doing instead? What are the differences between these two ways?

Because old way/new way is a team effort involving the athlete, the coach, and the sport psychologist acting as change facilitator, all these stakeholders have to contribute to the error analysis as well as to the other stages of the skill development process. The first author asked M's coach to describe her technique problem in detail. Faults highlighted included problems with the shoulder turn, speed of movement, elbow action, foot placement, and body rotation.

This initial description of the technique problem was very involved, with many components of the throwing action being implicated. The experienced coach's eye can readily spot numerous technique faults. However, the initial aim of any old way/new way intervention is to identify and select only one or two major aspects of technique for correction during a single session. The list of faults was condensed into one or two items that could more readily be managed during the skill correction process. Because the role of the athlete is central in old way/new way, M was asked to comment on her coach's error analysis and to describe her problem in her own words.

> (29 July 99): I am too early with the upper body; I open up and face forward when the left leg gets down instead of keeping my upper body (shoulders) sideways when I plant my left leg.

M's description provided a useful simplification of the basic problem. Based on this error analysis, an old way/new way protocol was designed and a special skill correction session was organized.

Stage 2. Learning Trial Stage

An individualized old way/new way protocol for correcting M's technique problem was prepared by the fourth author. The protocol was implemented in a single old way/new way learning trial (LT) conducted by the first author with the assistance of M's coach.

Prior to the LT, the first author, M, and her coach watched videotapes of erroneous and correct technique at M's suggestion. This session was followed by the first author's brief explanation of the LT protocol. M then did her regular warm-up, which took 30-40 minutes.

The actual LT included four steps: (a) improvement of M's mental and physical awareness, (b) systematic and progressive discrimination of the old and new ways, (c) generalization or practice of the new way, and (c) a review with instructions on how to handle spontaneous recovery of the technique error. Here are the coach's observations of the learning trial:

1. *Preparation for the LT.* Two days before the practice, the idea of a LT seemed still a bit strange to M. The day before, M was not yet strongly motivated to do the LT ("Well, OK we can do it."). But on the morning, she started to show a little enthusiasm about the LT, so her attitude was good. Prior to the LT, we watched the videos of throws at M's own wish—by comparing several competitions—to get a better idea of the correct way of throwing. She had a good warm-up and physical preparation for the training session following about three days of rest.

2. *Developing awareness.* M did not want to do wrong throws. When asked about her feelings and sensations, she had no clear picture of physical awareness. After about eight throws, she started to experience some feelings. Three or four throws were done in the old (wrong) way, others were correct. She had a strong image of the correct throw from watching a video and having done some training at home.

3. *A breakthrough.* A clear "A-ha!" experience emerged in body-sensations as M was requested to throw with her eyes closed. With closed eyes, she managed to feel how the old way of throwing worked: left arm first strikes strongly to the left and backwards-down and shoulder line turns open, then just supporting leg/foot lands down and the right arm moves low from the side and strikes in the end to the left side and downwards. Several throws with eyes closed reinforced these bodily sensations. M's initial resistance to old way/new way training disappeared, with emergence of good motivation to do the throws. About 12 "old way" throws were performed.

4. *The new way.* The shift to the new way was successful and quick. Bodily sensations of the new way were experienced immediately with each throw. M felt a need to compare the old and new ways: "Now I don't turn my shoulder into the open position but try to move my breast forward. I feel a tension (stretching) of the right part of the breast muscles and of the shoulder. My throwing arm goes up for the spike, as in volleyball." As sensations came, there was also a thought that her left side should move forward and maintain that longer. The right sequence became clearer: First land on the support foot then left hand moves to the side and extension of the right shoulder. The throwing arm moves automatically upward and forward. Throws in the new way with eyes closed resulted in too careful a landing of the support foot, producing worse throws in the new way.

5. *Comparison of the old and new way.* The old way/new way sequence of movements was done five times. Calling the patterns old and new ways seemed to suit M well. At this stage, there developed a clear sensation of difference in the arm movement. M began to feel a little tiredness. M clearly differentiated between old and new ways after each throw. When asked, M stated she would like to do even more old way/new way throws if only she were not so tired.

6. *Practicing the new way.* Altogether, six throws were performed in the new way. Despite tiredness, M did strong and correct throws with a long and strong pull. M began to feel more strong sensations from the support foot (compared to previous throws). The arm movement (throw) felt like a "volleyball spike." She reported strong sensations and better awareness of the new way. After the throws, a summary conclusion reinforced the successful training session.

7. *Conclusion.* Altogether, M performed about 40 throws during the 90-minute skill correction session (not including warming up). All throws were done with a good speedy rhythm. The learning process succeeded unusually well. During training, M's self-confidence clearly developed.

Stage 3. Post-LT Stage

The post-LT stage was concerned with evaluating the LT and reinforcing successful technique change. M's coach's highly positive evaluation of the LT was confirmed by M's comments in an e-mail message the following day:

> (12 Aug): Well, here are my comments on yesterday's throwing. I was very motivated before the session, but I had my doubts about old way/new way. Like I said yesterday, it was against my logic to throw the wrong (old) way on purpose, but now I can see why I needed to do it! In the beginning, when I was still fighting it (throwing the old way), it was difficult to say what I did. I felt it was a lot easier to feel the throw and what I was doing when I closed my eyes, and then I could very clearly feel what I was doing wrong.
>
> Already before the session, I had worked a lot on getting it clear to myself about the arm hitting it high. I didn't think about it at all, and it was not clear to me how wrong it was until I watched the videotape and compared it to my 1997-98 throws. I didn't feel it was difficult at all to throw the new way (i.e., changing the way to throw), and it also felt very natural. I think it was better to do the throwing inside into a net than outdoors because it was not difficult at all to focus on these "special things." I'm satisfied that even when I got tired at the end from making so many throws, I could still manage to do quite good throws the new way. I think yesterday's experience was a very important and interesting one! I'm also a bit surprised at how "easy" and how fast I was able to adapt to the new way to throw!

The first author reinforced these new feelings of empowerment and self-confidence in a return e-mail message and reminded M to practice the new way using imagery five to six times daily. The first training session following the LT (again in the hall) was successful. All three important elements of the throwing movement worked well. The coach's comments were as follows:

> (13 Aug): Throwing practice went very well. M did 20 throws, all with the new javelin (earlier before the old model was also used in training). All the throws were good (none were bad) and even better than during the LT (100% correct). M herself evaluated her throws (previously it was the coach who rated the performance). The throws with the right technique were easy to do for her.

M's e-mailed comments confirm her coach's observations:

> (13 Aug): Well, I had another very enjoyable throwing session behind me! We threw indoors again, because it seems like it's easier to concentrate on the important things. I would say I managed to throw the new way quite well, at least 95% of my throws very OK. It felt very easy to throw (hitting it high and feeling the pressure in the shoulder), especially considering I threw quite a lot only two days ago. So old way/new way seems to have worked well for me.

The first training session outdoors, the second after the LT, was important as a means to check if additional distracters would affect M's performance of the new way and constituted a further test of transfer of learning. Again, the results were very good.

It was a successful session. Out of a total of 20 throws, 15 were really good, technically. Only 5-6 throws were a bit different but not exactly in the old way. An instance of spontaneous recovery of the old way was handled well. Thus, the initial success experienced during practice indoors transferred to outdoors throwing without a problem. However, by the end of the session, there was some pain in the left knee. M was reminded to continue regular daily imagery of the new way.

> (24 Aug): M had a very good training session. Out of 15 technically good throws, only 1 or 2 were not quite satisfactory. She experienced no pain in the knee and achieved throws of 58-59 m with 70% effort.
>
> (26 Aug): M made it in the qualifications (the qualifying distance was 61m). She did 61.50 m, her personal best this season with the new javelin.

The following day, M had a bad problem with her knee. She could hardly walk, let alone run. Being a great fighter, she managed to throw over 60 m in the competition, just a few centimeters from the finalist's group. She later successfully recovered from a knee operation, put in a record breaking performance in the national competition, and commenced preparations for international competition.

Study 2: Technique Correction For a Female Sprinter (J)

The first case study and previous experiences with other top athletes all strongly suggest that old way/new way is an effective intervention strategy for rapid correction of technical errors with national and international level athletes. However, one limitation of these case studies is that the interventions were all conducted at the end of the season, and it was not possible to measure baseline performance and other outcomes of the learning trial. Therefore, a more controlled study, involving a young female Olympic sprinter, was employed.

Background to the Technique Difficulty

For about two years, J experienced a problem with her starting technique. Instead of maintaining a straight back, her back rounded when she pushed off from the blocks. This made the direction of the push-off too upright; energy was wasted in this upward movement instead of being directed into forward motion and the

push- off, therefore, lost power and speed. Her rear leg's movement pattern for the first step was also incorrect, as she raised her heel too high while bringing the rear leg forward, resulting in a braking effect on first contact with the ground.

Possible reasons for these technique problems were explored in depth, and it was concluded that the strength development of lower body and middle/upper body, especially the middle part of the body, had not been kept in balance. The legs had become too powerful in comparison to the middle part of the body. The cause of this imbalance in strength development was traced to her training regimen. During the 1998 training season, a heavy harness (up to 20kg) was used to develop power and acceleration in starting. The heavy load imposed by the shoulder harness may have caused the back to round and changed the movement pattern at the start of the push off. The tendency to round the back, having been repeated (practiced) and learned, was now a learned error and therefore persisted even when not wearing the harness. The rounded back at the push-off affected the movement of the rear leg, reducing the upper body support required for a fast forward movement of the leg and causing the heel to be raised too high.

During the training season, J's starting technique underwent correction attempts using the traditional skill correction approach described earlier. During these sessions, J repeatedly performed starts with the conscious aim of changing the movement pattern. This process was assisted by continual feedback given by the coach after each start. Starting technique improved slowly but progressively in the desired direction. However, during competitions, her technique repeatedly failed.

After consultation with the first author, a decision was made to try to improve J's start using old way/new way. After careful consideration, it was concluded that to correct the problem with her rear leg action, the problem with the rounded back had to be corrected first, because the leg problem appeared to be a consequence of the back problem. Events then took an unexpected turn, as follows:

> (29 Oct): J's coach learned about old way/new way from the first author, and they discussed the possibility of using old way/new way with J.
>
> (1 Nov): J's coach attempted to conduct the LT on his own, based on general ideas about the method. Being untrained in the methodology, his attempt was unsuccessful.
>
> (3 Nov): J and her coach then approached the first author to learn why the method did not work for them. It was decided to conduct the LT together as a team, including athlete, coach, and sport psychologist, so that the necessary old way/new way expertise could be focused on the problem.

Stage 1. Prelearning Trial Stage

Motivation to Change. Both coach and athlete were highly motivated to try old way/new way because all previous attempts to permanently correct the technique problem over the last two years had been unsuccessful.

Error Analysis. A thorough error analysis was done. J and her coach wanted the push-off from the blocks to be more efficient.

Stage 2. Learning Trial Stage

An individualized old way/new way protocol for correcting J's technique problem was prepared by the fourth author. Similar to the previous LT with M, the session began with the first author briefly describing the four-step protocol, after which J did a regular warming up lasting 30 minutes. Then, all four steps of the LT were conducted.

During the LT, starts were video taped and immediate replay was used to emphasize erroneous and correct starting technique. After each trial, J reported her feelings and kinesthetic sensations accompanying the erroneous and correct execution of starts. These open-ended self-reports were taped and later transcribed. J's coach made the following observations of the learning trial in an e-mail message to the first author.

(12 Nov): Here is my report of what happened.

1. *Preparation for the LT session.* J was well informed about the learning trial. At first, she was somewhat reserved and skeptical about the system. I think I was more interested. She didn't expect marvels but was curious to see what would happen. Information you gave before the session was good and set her to concentrate on the session. Her warm-up was very typical for her start training and the presence of the other girl didn't seem to disturb her.

2. *Beginning of the trial.* J performed starts in the old way. She said it was easy to do them, because she didn't have to try to express any particular point. The hardest thing was to find clear "feelings" and it took some time to really find some exact sensations. I think doing starts with her eyes closed helped a lot. By the end of part one, she found some clear sensations of that kind of start.

3. *Finding the "new way."* At the beginning, it was hard to find the technique we aimed for. It took five tryouts to find that the movement of the left arm could direct her toward the right technique. The next five starts went well and she got a hold of the "new" technique. I think that in a complex movement like the start, it is not possible to think of only one thing but try to think the movement as a whole and try to find the right words for the athlete which "ring the bell" for her. That has not much to do with pure biomechanics. I think the question is rather to find how the athlete really experiences the movement.

4. *Comparing the old and the new way.* There was no problem doing starts in either way after she had found "the leading arm movement." Moving the front block in the previous step made the old way a little bit better, but there was still quite a clear difference between the old and the new way.

5. *The new way.* The last six starts went well. She was very tired after the session but could still concentrate well to the end. I checked the videotape and there were 38 starts altogether. That is a very big number. Now I look forward with great interest to see how well she can perform her starts in future start sessions.

Sport Psychologist's Observations of the LT

Step 1 (8 starts). J did starts using the videotaping and replaying technique for each start. She asked if she should emphasize the mistake (it turned out

that in their unsuccessful session, they did exactly that). I said we don't need that, just the usual erroneous start. She could not report anything special in the first four starts. Closing eyes helped ("getting up, in a rush"). The last four starts were really typically bad (they had worked on this technique problem for a whole year!).

Step 2 (9 starts). First, she had no clear idea about the right technique. It looked like her right technique was not yet developed. The first five starts (except one) were not good enough. We tried and experimented with different approaches. We tried with her left hand moving forward (it was bent and went up in erroneous attempts). At first the new way felt unnatural, not easy (as with the old start technique). Then she started to feel how her left hand moves forward and it became easier to get a better awareness. We deliberately tried to move her forward from the blocks (based on what happened during her ineffective movement pattern) and succeeded. The left block was moved a bit forward.

Step 3 (11 starts). Verbalization of bodily sensations was OK: I discriminated for her the first two times, and she did it the remaining 3 times (all taped).

Step 4 (6 starts). All good starts even though she was really tired (in a usual training session she would only do 8-10 starts and not 38)! J's coach recorded her sprint time, although we had agreed not to focus on speed at this point! The coach noticed that the less she tried (being so tired), the better her start was. The last attempt was technically her best ever start.

I ended the session with a short summary of what was planned, how we had progressed, and what happened and reiterated the notes about the expected 80% or better new way starts from now on and how to handle spontaneous recovery of errors.

Today I called J's coach again. He and J were very satisfied. The coach was especially convinced that it made all the difference when this new methodology was implemented in a joint effort rather than trying to do it on his own! In other words, a coach with a special training in using the old way/new way could correct an error in technique. However, focusing on just one selected aspect of performance and coping with an athlete's resistance may be problematic. Therefore, a joint effort involving an athlete, a coach, and an old way/new way facilitator seems a better and more effective option.

Stage 3. Post-LT Stage

A follow-up in training and in indoor competitions was conducted to evaluate the impact of the old way/new way procedure on athletic performance. It was hypothesized that the correction of error in starting technique should result in gradual improvement of J's starts in the 60 m and 100 m events. It was anticipated that this success would also have a motivational impact and improve starts in the 200 m. As predicted, the percentage of correct ("new way") actions post-LT was 87% in practice sessions and 85% in indoor competitions.

Now that J's technique was corrected, and it was clear that the learning gains had successfully transferred to the competition setting, J's performance was followed up further in competitions to test whether the "new way" of starting would actually produce faster times and that it was actually a "better new way." Immediately post-LT, both results in tests (60 m) and results in the competitions (national and international) improved meaningfully.

After the first technique problem (i.e., rounding the back) was successfully corrected in the first learning trial, it was decided to conduct and document another trial aimed at correcting the second problem with starting technique (i.e., the rear leg problem). Until now, any improvement in starting technique and in competitive times had only been observed during indoor competitions.

Second Learning Trial (LT2)

LT2 was conducted following the same procedure as for LT1 and lasted about two hours. J's warm up was shorter than usual, about 25 minutes, and she did not show as much enthusiasm as during LT1.

An error analysis was undertaken to identify the reasons why the mistake (rear leg upward movement) was made. This mistake had been consistently observed for two years. All attempts to correct it simply by asking J not to raise her rear leg but just move it forward had been unsuccessful. As J's coach pointed out, "Simply telling her what not to do did not work."

After some initial trial and error in identifying the correct "new way," changing the position of the pads on the starting block so that the distance between J's front and back foot was shorter, facilitated the new movement. All in all, it was a successful intervention that helped to make the LT2 successful. The coach's observations of this second LT were as follows:

> This second LT produced even better results than the first one. The change in J's technique has been very persistent, and in all training sessions after the trial, her starts have been 95% to 100% new technique. I think we made the right choice in first correcting the push-off from the blocks (LT1). Correction of the rear leg movement and making the first step short and fast is now permanent. I am convinced that old way/new way is a very practical method for coaches to quickly correct technical errors.

Results

Lasting improvement in technique and a transfer of learning gains to competition were the main predicted outcomes of the old way/new way skill correction sessions with athletes. Typically, after only one session with an athlete lasting around two hours, including a half hour warm-up period, a professionally planned and administered old way/new way protocol was followed by (a) 80% or better improvement in execution of the skill or technique; (b) accelerated learning; (c) immediate and full transfer of skill to competitive performance settings; (d) improvement that endured, with no requirement for additional correction; (e) improved affect and self confidence in the athlete; and (f) acknowledgement by the coach and athlete of the practicality of this methodology.

Table 1 Mean Percentage Correct Actions Pre- and Post-Learning Trial During Practice Sessions and in Competition

Event		Pre-LT		Post-LT	
		Incorrect	Correct	Incorrect	Correct
Javelin	Practice	90%	10%	15%-20%	80%-85%
	Competition	100%	0%	10%	90%
Sprinting	Practice	100%	0%	13%	87%
	Competition	100%	0%	15%	85%

As expected, Table 1 shows the dramatic improvement in percentage of correct javelin throwing actions and sprint start techniques following one learning trial. Three separate sprinting training sessions were observed in order to evaluate the impact of old way/new way on subsequent performance of starts. The results were as follows: 9 technically correct starts from 11 starts (82%) were observed in the next training session, and 9 technically correct starts from 10 starts (90%) were observed in the two subsequent sessions. Furthermore, spontaneous recovery of erroneous starts was handled effectively. Learning gains also transferred successfully to indoor competitive performance.

Visual confirmation of technique improvement was also obtained using video. The differences between the old and new ways were clearly visible. Technique faults were now corrected, and her back stayed flat and her head was in a straight line with the upper body. In addition, her left arm was driving her body more actively forward.

Now that J's starting technique was corrected, and it was clear that the learning gains had successfully transferred to indoor competition, J's performance was followed up further in outdoor competitions at 8, 12, and 14 weeks postintervention and compared to her baseline (pre-LT) times to test whether the "new way" of starting would produce faster times in this setting, as well. In 30 m tests (8 observations, averaged at each time), improvement in performance (in seconds) was revealed with a drop from 4.47 (pre-LT) to 4.38 (2.01% improvement 8 weeks post-LT) and to 4.27 (4.47% improvement 12 weeks post-LT). At the same time, J's results in national and international competitions in 60 m (15 observations) also improved. Specifically, her times decreased from 7.71 (pre-LT), to 7.52 (2.46% improvement 8 weeks post-LT), to 7.44 (3.5% improvement 12 weeks post-LT), and to 7.36 (4.54% improvement 14 weeks post-LT). The magnitude of the effect of our intervention reflected in correct performance of starts and a decrease in times both in 30 m (ranging from 2.01 to 4.51%) and in 60 m (ranging from 2.46 to 4.54%) seems impressive. However, the practical meaning of these changes should be compared with what they represent in the real sport world. For instance, how would they compare with improvements expected just due to training for 8 and 12 weeks? What is the role of an athlete's skill level (a novice improves quicker) and the time of the season (a cycle of preparation)? In our particular case, J, as a high-level sprinter, had already been training intensively for six years, and therefore

large improvements after 8-12 weeks were not expected. However, as her coach indicated, the main practical significance of this short-term intervention was a rapid and permanent change of starting technique accompanied by enhanced motivation and self-confidence. Using the traditional skill correction approach, at least 50-60% of all starts would still be faulty, especially in competitions. This would require additional and often frustrating work, which would distract the athlete and her coach from working on other important aspects of their preparation.

Taken together, these findings indicate that the new starting movement was indeed technically superior to the old one. Moreover, the results of the second learning trial with J to correct the back leg problem during starts were equally impressive. Before intervention, 100% of starts during practices were faulty; after intervention, all starts were correct and, most importantly, this change was permanent.

Discussion

The aim of this exploratory study was to determine whether old way/new way would be effective in skill correction with Olympic level athletes who were experiencing established technique problems. Both of our participants served as their own controls, and the findings provide an encouragement for future work incorporating more rigorous experimental controls. However, when considered along with all the prior research on old way/new way, these results suggest that this innovative methodology can greatly reduce the adaptation period to a new technique or to a change in skilled performance with Olympic athletes. Based on reports from both coach and athlete, it was clear that despite quality coaching and ongoing and prolonged attempts to improve the technique problem, there had been no dramatic improvement until old way/new way was used. Some degree of improvement had been noticed during training sessions, but these gains had been slow, and in any case, they had not transferred to competition. With no change in the amount of technical work spent on skill correction and development nor in other influential factors, the only thing that really changed prior to the observed improvement was the introduction of old way/new way.

Old way/new way differs from both conventional and operant conditioning approaches to error and technique correction and skill development. These differences are the key to its effectiveness. For example, it differs from conventional coaching in that (a) persistent and consistent performance errors are considered a sign that learning *has* occurred, rather than a sign of learning failure or inability to learn; and (b) habitual errors must be acknowledged and practiced, not ignored.

Although there is scientific support for paying more attention to what athletes are doing wrong when developing their sporting skills, the sports coaching literature makes few references to this idea. An often-quoted exception is the example of the baseball coach who made his pitchers practice throwing wide of the plate as well as directly to it (Kerr & Booth, 1977).

Where sport psychology practice is concerned, the old way/new way procedure is well structured and provides an opportunity for a well-planned intervention with a very clear focus. Error analysis and emphasis on movement patterns extends the sport psychologist's potential to work as a team member with a coach and an athlete. Old way/new way appears to offer a totally new area for direct intervention in skill development (previously, the domain of the coach) and is

clearly different from what is currently known about both physical and psychological skills training. Moreover, old way/new way represents an individualized approach to the optimization of athletic performance.

Old way/new way coaching skills can be learned by sport psychologists, coaches, and athletes and integrated into their professional toolkit. However, the initial lack of success with the method experienced by J's coach, who was unskilled in old way/new way, indicates that proper training in this methodology is essential. Coaches, athletes, and sport psychologists all have their own established ways of developing skills and correcting performance difficulties. These ways, like all established habits and skills, are protected from change by the proactive inhibitory mechanism, making self-change a difficult and prolonged process, even for highly motivated individuals. This barrier to change is effectively addressed in an accredited old way/new way training course.

The clear theoretical underpinning of the old way/new way procedure (Lyndon, 1989, 2000) enables a sport psychologist to predict an athlete's response and to anticipate the athlete's progress during the skill correction process. This is clearly different from traditional interventions that teach self-regulation skills. However, old way/new way is not a replacement for teaching mental skills and other psychological techniques for improving performance. Since old way/new way accelerates learning, it can make these psychological interventions more effective. For example, old way/new way used in combination with the IZOF model to predict emotion-performance relationships (Hanin, 2000) might be instrumental in more rapid identification of the individually optimal technique that builds upon an athlete's strengths and compensates for his or her limitations.

Finally, a further promising dimension to the old way/new way methodology comes from its clear connections with metacognition, which is an important aspect of modern learning theory (Ausubel, 1968; Dawson & Lyndon, 1997; Flavell, 1987; Kerr & Booth, 1977). Our findings indicate that metacognition appears to be equally relevant to learning in an athletic setting (Ericsson et al., 1993; Singer, 1988; Singer et al., 1993). Meta-observation (Shanon, 1990, 1998), a process of reflecting on the content of mental states accompanying performance and monitoring or control (Hanin, 2000), checks and evaluates performance related thoughts and bodily sensations and helps the athlete to deautomatize a learned error and shift to a more effective and optimal way of skill execution. However, it is important to realize that the core of the learning trial is not in merely increasing an athlete's kinesthetic awareness of erroneous (automatic) and correct way(s) of task execution. Rather, what matters most is the activation of a mediation process contrasting old and new movement patterns that is crucial for overcoming proactive inhibition (see Dawson & Lyndon, 1997 for a detailed discussion of old way/ new way effects in an academic setting).

Old way/new way also offers a new model for coaching and sport psychology. The key components of this model are these:

1. Old way/new way basically follows a constructivist model. The athlete, as the learner, is the one who is responsible for learning, understanding, and changing.
2. The coach's ability to identify and diagnose the error or technique problem is critical, as is his or her ability to identify, explain, and demonstrate to the athlete the "correct" or individually optimal technique. This befits the coach's role as the subject matter expert.

3. The athlete can be empowered through old way/new way to take on personal responsibility for improving. The old way/new way as a metacognitive learning strategy offers direct control over the cognitive processes involved in skill development and correction.
4. The athlete's prior knowledge and skills (incorrect as well as correct) must be incorporated into any coaching strategy.
5. If no conflict is likely between new and preexisting knowledge and skills, then a conventional coaching strategy is suitable, and new knowledge and skills will consolidate and build on old.
6. However, when prior knowledge and skills are different from and likely to conflict with the new, the athlete needs to follow a prescribed old way/new way learning protocol and not just attempt to practice the new while ignoring preexisting knowledge and skills.

The authors are currently exploring the potential of old way/new way to (a) improve the performance of more than one athlete in a single session, (b) accelerate learning of performance enhancing mental skills (self-control), (c) enhance team skills such as communication and coordination, and (d) accelerate optimization of emotion-related states.

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Authors' Note

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