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Deliberate Practice in Tennis

Introduction

"*Practice is everything*". Periander of Corinth, one of the 7 sages of Ancient Greece, had this insight 26 centuries ago. How right was he?

Tennis is said to be like playing chess on a big board. Is there a way of practice that is beneficial to both sports? Indeed, there is: *Deliberate and Well-Structured Practice.*[1]

This article attempts to describe the model of Deliberate Practice (DP) and its potential applications to tennis.

What is Deliberate Practice?

Lev Vygotsky, the legendary Russian psychologist of last century (1896-1934) had proposed the *Zones of Proximal Development.*[2] In Vygotsky's work, authentic learning tasks should be designed so that they are more difficult than students may handle if left alone, but may be resolved with the support of peers (or teachers) using appropriate strategies.

Similarly, Collins et al. in the 80's used the term *successive approximations* in order to describe the process of adaptation to a sequence of ever-stretching difficulties, to reach the desired goal. The goal, in turn, changes or develops as a function of time and experience gathered.[3]

Given that animals employ similar methods, how can humans make a difference?

Recursion is a mathematical concept applied to language by Noam Chomski in 1965.[4] Humans may engage in a recursive process enabling us to build cyclic or nested concepts, thus demonstrating complex thought and communication. *Deliberation* is both an unique element of human language and an inherent part of such a process. But, what does language have to do with training? Individuals cannot engage in a complex form of practice unless they grasp a similarly complex conceptual scheme, the latter being possible through language.[5] "Deliberance" is associated with something *purposeful*, conceived as *intentional, premeditated, and voluntary*. It also connotes *phenomenal consciousness*, which is the subjective feeling of a mental state and *access consciousness*, referring to the availability of a mental representation for use in reasoning or rational control of action.[6]

The qualification of such concepts results in the conception of a particular way of practicing, leading to superior performance by utilizing our unique human abilities. The type of practice preferred by experts in their respective field, is a special form of practice; it differs from playful activities and formal paid work (i.e. work that one is *directly* paid to do), or monotonous repetitions of the same activities that would merely strengthen current mechanisms – either correct or wrong ones.[8-11] In most cases it is not even pleasant, at least in the initial stages. This form of practice was distinguishably named *Deliberate Practice* by Ericsson et al in their classical article, "The role of deliberate practice in the acquisition of expert performance".[1] DP will mobilize all cognitive resources not only of the performer but of many people of their close environment (trainers, teachers etc.).[6] *DP model* was articulated after directly recording world class performers' practice routines: violin players [1], but also expert pianists;[7] soccer and hockey players, [8,9] team ball sports,[10] triathletes,[11] modern dance,[12] professional writing, [13] and medicine,[14] among others.

According to Ericsson,[15] the core assumption of DP, is that "*... expert performance is acquired gradually and that effective improvement of performance requires the opportunity to find suitable training tasks that the performer can master sequentially – typically the design of*

training tasks and monitoring of the attained performance is done by a teacher or a coach". Repetitiveness is not a sufficient condition for effective practice. After individuals have completed their adapting stage, the mere act of performing the same activity repeatedly, induces no further physiological and cognitive adaptations and hence, performance improvements [16] (*cf.* contextual interference [17]). It is worrisome that drills stressing repeatability (blocked practice [18]) are still popular in tennis.

One may perceive DP as the special kind of training characterized by two features or components: a need for active mental participation of the learner (focus and heightened awareness), and the step-by-step increase in difficulty, (modification of learning stimulus) in order to constantly stretch performance limits.[15,16] The latter is led by "the constant evaluation of one's current skill ... against that of a more skilled model" [6] (Figure 1). In tennis, this translated into exposing athletes to appropriately selected models of higher performance. These models could be diagrams, videos, drawings or other representations of the next level of the specific skill currently being practiced (e.g. a part of a footwork pattern, a phase of a stroke, etc)

Characteristics of Deliberate Practice

Arrested Performance

Performers, even elite ones, may choose to merely perform for recreation, or engage in DP activities and evolve *further.*[19] In both music and sports, children who excel among their peers are found to adopt DP more than their peers do.[11] Experts of any age and level engage in DP activities. Even after further performance gains through deliberate practice, some individuals quit DP. Performance, even at world-class level, starts to deteriorate, as DP is necessary to maintain a high level of performing.[15] When one drops DP, performance stabilizes for some period. This state is known as *arrested development* [15] (Figure 2). Tennis players should think of practice (which is not another name for friendly matches!) as a never-ending process, necessary to merely remain in technical shape and not only to evolve. Moreover, there is a constant need for DP throughout the season; even more so at periods when technical changes are introduced.

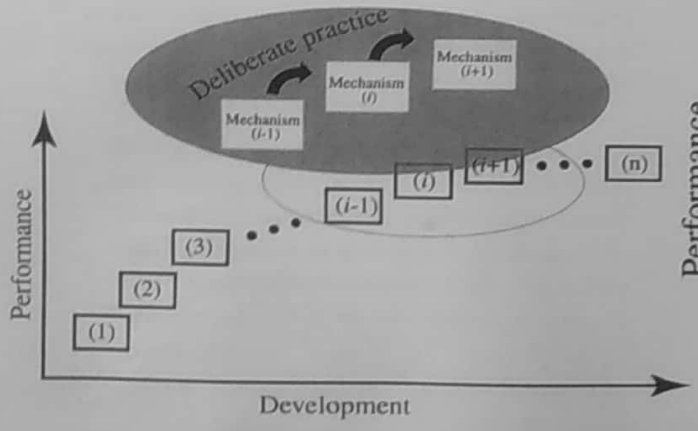

Figure 1
A step-by-step performance improvement [15]

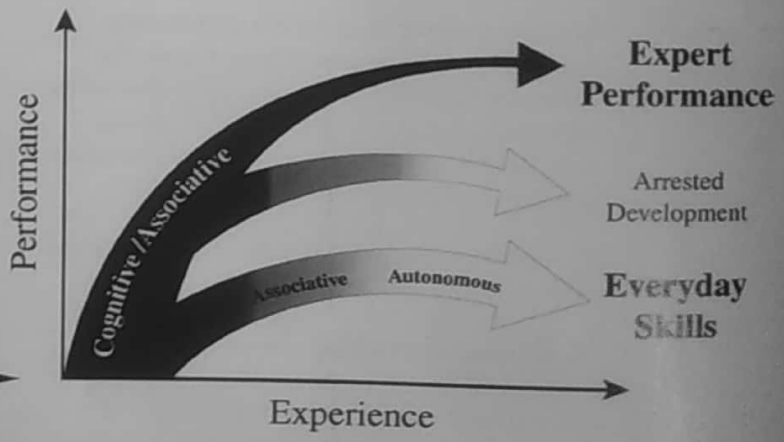

Figure 2
As soon as DP ceases, development becomes "arrested" and stops improving for a period of time before it shrinks [15]

The Paradox of Automatization

Ouspensky describes man as an increasingly complex automatic machine. The system overloads and automatization fails in a self-defeating manner. The real paradox is that the more automated one is, the more one tends to fail. But what *is* automatization? The dual processing theory explains that:[20] "*The transition from controlled to automatic processing occurs in this model as the data modules become capable of transmitting their output without mediation by the Control System*". Conclusions arrived at by the authors are also insightful as to the characteristics of automatization: [20] "*Automaticity leads to fast, parallel, robust, low effort performance, but requires extended training, is difficult to control, and shows little memory modification. In contrast, controlled processing is slow, serial, effortful and brittle, but it allows rule-based processing to be rapidly acquired, can deal with variable bindings, can rapidly alter processing, can partially counter automatic processes, and speeds the development of automatic processing*".

Individuals not maintaining such a practising schedule watch their performance become arrested, and eventually deteriorate, despite accumulating active experience in their field.[21] Performing should be viewed as what worsens their level (Figure 3):

DP » Improvement » Performing» Worsening» DP...

Many tennis coaches believe that the golden grail of practice is to look for automatization. However, practicing in ways of fostering deliberation (slow practice, imagery, having players describe what they think they do, etc) may actually be more effective in the long term. Tennis players should develop a kind of self-awareness towards recognizing the extent of their automated movements, and should keep refining them by using DP tactics. For example, tennis players often rehearse a movement between points. We recommend to execute it in a slow and conscious manner.

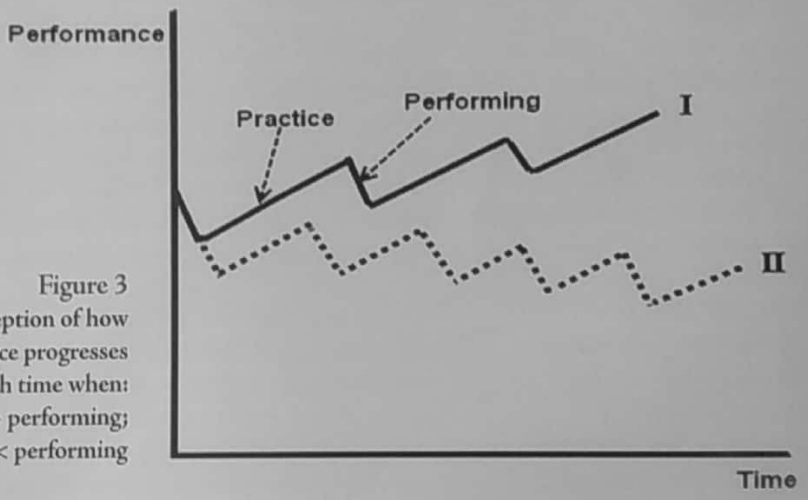

Figure 3
A conception of how performance progresses with time when: I) DP > performing; and, II) DP < performing

Age and Deliberate Practice

Accuracy and speed of memory processes undergo systematic age-related declines from young to older adulthood.[22] an observation matched by most types of cognitive-motor performance as well. Motor-performance declines with age as well.[23] For older experts, DP is a prerequisite to merely preserve their level of performance from deterioration.[22]

Does DP improve the performance of aged individuals? There is a positive consensus in regard to the plasticity of the nervous system of older individuals.[24] Either out of choice or need, both elite athletes and older individuals progressively de-emphasize physical components of their technique, while relying more on meta-cognitive skills to achieve similar or superior performance [22,25] and to shift their focus to "details", at the expense of a reduced emphasis to increasing their practice hours.[26]

Young elite athletes and musicians are found to devote more time to DP activities rather than to other playful activities, unlike their less skilled counterparts.[15] The age when children usually start, or exhibit a capacity for more formalised learning experiences, other than mindless play, in a highly technical activity, like piano, judo, tennis or figure skating,[27] is around 5 years. Normally, DP may be introduced somewhat later, as soon as children demonstrate the capacity to perfect technical details; and that would be starting from seven to eight years of age. Skill learning cannot occur without the benefit of higher thought processes.[28]

While *play(ing) and stay(ing)* is fun, trainers should invent ways of eventually implementing DP protocols as well. We could motivate youngsters to develop technical aspects in tennis much the way they do it in martial arts:

rewarding children, be it in a symbolic context, based on the predetermined skills they actually master, all the way to introducing periodical tests and establishing hierarchies. It is crucial to help children realize, from early on, that there is an extra component in their practice, which is distinctively different from playing, from competing, and even from excessive physical effort, that indeed would seem to be too popular a trend nowadays: and that extra component would be *technical mastering*. On the other hand, seniors should be informed what DP is about and what opportunity it provides for improvement; thence they are expected to come to appreciate what benefits they may enjoy through a mild form of practice.

Effort and Compliance with Deliberate Practice

There are cases of world class level attainment with as few as 500-1000 hours of training (memorizing digits), as well as cases in which DP averaged as much as 25.000 hours – or more.[28] Attentional, physiological and various other parameters restrict daily practice to 5-6 hours of focused practice.[15-30] In formal teaching, as much as 50% of time spent is time lost (athletes waiting, transitioning between groups and tasks etc). An alternative strategy might be necessary towards engaging learners more efficiently, like the "good old" auto-supervising model.[31] Superficially, DP seems to be a dull task producing no immediate positive results of any kind; conversely, distress might come out to be the usual short-term outcome.[1,32] The average person usually drops DP. Hence, if DP is a truly part of the mechanism mediating superior performance, learning systems should also incorporate strategies towards specifically overcoming the motivational detriment. Others argue that DP can be enjoyable in sports, [25–27] and athletes may still become successful in spite of late engaging in DP.[26,27] The present author argues that DP is capable of becoming pleasant as soon as the individual has mastered the skill of concentrating and entering the *flow state*.[33] Children at early stages, and even grown athletes later on, should be encouraged to perfect technical aspects. An effective method for achieving this would be the urging of performers to engage in peer-teaching activities. The "secret" there would be a practice of mutual assistance by demonstrating, explaining and discussing technical details. However, this shift in responsibility would require the development of more comprehensive biomechanical models and teaching systems.

Criticism

The entire conception of DP notion has been subjected to criticism *not* regarding its effectiveness, but rather to its alleged absolute superiority even against the rival conception of talent.[34] Then, is it DP or talent? The author argues against this bi-polar scheme, expressing divergerent concerns about the DP *model*. In the next section an epistemonic approach of DP is attempted.[1]

Epistemonic Definition of Deliberate Practice

DP may better be conceived as a *value-judgement*. Indeed, starting from Newton, every scientific and philosophical field operates in search for the *archimedean point* which can and shall be demonstrated as its solid foundation. Episteme, however, is not bound to experience or sensorial experience (*"fraud of the senses"*), but to *surveillance*, as it models the world on pre-extant abstract formulation according to the discipline of mathematics. *Deliberance, consciousness, practice*, all entail value judgments. However, this should not be taken as an inhibitory factor, but as a fine opportunity to articulate a model as defined by one´s own needs without being restricted by any existing external truth we set out to discover. Truth cannot be found in reality. Moreover the DP-model should not be perceived as a conclusion, reached by sampling or otherwise, *posterior* to examining a population, but in essence as a postulated internalized abstract pattern *prior* to studying it by means of a process of interpretation and application. Models articulated as a result of experience are logically incorrect.

Tennis and Deliberate Practice

The author argues that the present habits in players' practice stresses automated (fast) movements to excess. Players strive to practice faster and faster, when inclusion of slow practice would conceivably and observably improve their technical awareness. At least in part, this may stem out of the established approach to expertise being considered objective, when in fact it entails value judgments. A less rigid approach/definition might assist in considering more possibilities when trying to attain expertise in sounder systemic considerations, other than just merely imitating professional tennis players in action and in style, as though their performance were some sort of choreography.

In this context, current scientific technical models are inadequate. Epistemonic models need to be developed, *a priori* predictive of optimal biomechanics rather than merely reporting how top players already perform.

Suitable role-models should be selected towards increasing the motivation of younger players into shifting their attention to quality of practice rather than to quantity or difficulty. The qualitative criterion

may be said to be the essence of DP.
It is quite difficult to swallow how current trainers feel free to go about erratically switching back and forth from mimicking top players to projecting and refining elaborate models that are abstractly conceived. An educational protocol for trainers might be in order.

Table 1
Deliberate Practice in Tennis

- DP is a necessary part for the development/maintenance of contributory expertise (i.e. world-class performance in tennis).[1]
- DP is an aspectual way of practice, but it does not include the actual content of practicing. Therefore it may fail if the content of the practice is not appropriate.
- DP is the "gold standard" of practice for all skill levels – even if performers should expect their capacity of engaging in DP to evolve with time and practice.
- Tennis coaches are advised to carefully plan the tasks to properly stretch their athlete's capacities.
- In absolute terms, DP is demanding both in time and in physical/mental resources.
- Slow practice ought to be an inherent part of DP. Tennis pros should not hesitate to include sessions of slow practice in every occasion.
- "Kill" mindless waiting time.
- Properly motivate learners to enhance their adherence to DP utilizing methods such as role-modeling and re-definition of "success".
- Experts engage in a different type of DP which is inaccessible to novices. Novices have different attentional, motivational, cognitive and physical abilities.
- The baseline for world-class performance attainment in tennis should be an average of 3-5 hours daily of DP, 340 days/year for about 10 years (playing and general practicing time not included).
- Automatization is of the utmost importance in performing but turns out detrimental in practicing. DP leads to better performing-automaticity.
- Improvement in older individuals is a mental process in most aspects; DP is important in that age too.
- Younger individuals will have to play more, both in the long- and in the short-term, even though they have to sacrifice a part of immediate enjoyment.

Note: Ericsson's well structured practice only refers to the importance of selecting tasks, not to a specific selection thereof.

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Conflicts of Interest: none declared.

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