The Flow State Revisited

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When high concentration is coupled with near automatic skills, stimulated by the influence of neurotransmitters, the resulting changes in brain waves can induce a mental state called 'Flow' or 'being in the zone'. Flow is an optimal experience which can be brought about by engaging in challenging activities that demand intense levels of concentration and which contain clear goals and provides immediate feedback (Moran, et al., 2018).

It should be noted that good outcomes do not need flow-like states (di Fronzo et al. 2016). Being in a flow state or in the zone, according to the literature, is believed to enhance performance in situations where:

- skill levels are high (skills have approached being automatic, meaning doing the task without thinking);
- the challenge you are facing is high, and
- you have a strong drive to excel (you are motivated to dig deep for something extra).

As mentioned, the brain retains a copy the last outgoing signals sent to the muscles, called the "motor efferent copy" (Whitford, 2017). When the first shot fired is good (no error correction needed), all going well, the brain can keep repeating the last action to progress, apparently effortlessly, through the series. If "flow" changes normal patterns in the brain, as noted above, due to release of neurotransmitters, this could possibly contribute to more brain resources being assigned to the present task for its duration, presumable increasing performance.

The processes underpinning the Flow State, according to the literature, are summarised in Figure 1.

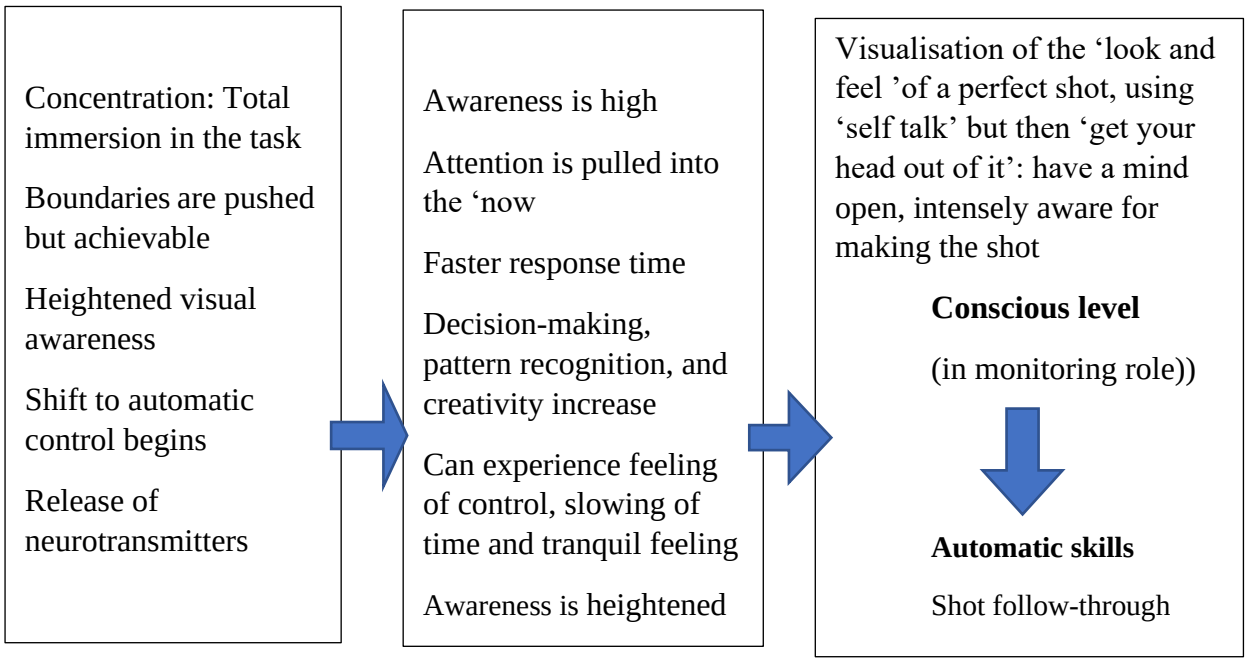

Figure 1: Flow process during high concentration

The box on the right side in Figure 1, refers to the shot process beginning with visualisation of the look and feel of a perfect string of shots, prompted by 'self -talk'. Prior to making the shot or shot sequence, terminate self-talk (get your head out of it). Make your mind open and intensely aware, as you go into the process of making the shots. In the process the conscious level of the mind becomes relegated to a monitoring or watching role, ready to act it something goes wrong and that the performance of the skills is automatic and therefore faster.

People who have entered flow states often refer to automatic processing in which they report task focussed behaviour without consciously thinking (Gold and Ciorciari, 2020). There is evidence that flow requires strategic control monitoring and cannot be considered fully automatic (Moran et al., 2018). A person stays aware of what is happening, though may not have to intervene. "Flow is denoted by smooth and accurate performance, which can be accompanied by separation (dissociation) from the passage of time" (Gold and Ciorciari, 2020). Dissociation can also be manifested when the performance becomes like "watching a movie" of the action one is carrying out (Anderson, 2019).

The inner workings of the Flow State are shrouded in mystery (Gold and Ciorciari, 2020). A review of 20 relevant studies of "flow" listed the likely factors for entering flow as being: a challenge-skill balance (the challenge is within reach of existing skills); the goals are clear (so all your resources can be thrown at them); and the feedback is unambiguous (Harris et al., 2021). However, they were unable to say whether these factors cause flow. Their review gave a summary of the experience of flow as: the merging of action and awareness; loss of self-consciousness; transformation of time and that the experience is rewarding (Harris et al. 2021). They refer to a previous explanation for the flow-performance relationship as comprising performance enhancement because of the functional mental state occurring during flow; and enhanced motivation to practice. They conclude that it is not possible to be sure how flow benefits performance or even the direction of the relationship (do the "before" factors cause flow, or is that inferred after the experience").

The experience of the Flow State can include: a feeling of control over the activity; experience of time distortion, in which a person loses the awareness of themselves and thoughts of everyday problems; a feeling of transcendence where the person feels a sense of unity with the activity (Gold and Ciorciari, 2020). They propose that the following changes in brain neural activity induce flow: there is a shift brain processing away from the frontal left area to the visual-spatial process of the right portion of the brain, resulting in higher levels of performance where attentional resources are fully utilised (Gold and Ciorciari, 2020). A chemical change occurring during flow is the release of neuro-transmitters which Bortollo (et al. 2020) attributes to having a major contribution to the experience of the "Flow state". Neurotransmitters can affect other neurons, glands and muscles.

A condition for flow is said to be the challenge/skills-balance which indicates a state of high mental workload from deep involvement in the task (Gold and Ciorciari, 2020). They report views about how Flow states occur such as inhibition of certain executive functions of the brain which free up more resources to be dedicated to faster processing, leading to more automatic functioning. Another view is that synchronisation in neurons and networks occurs creating efficiencies which improve communication within the brain creating holistic higher-order experiences that resemble Flow states (Gold and Ciorciari, 2020). This has been called the Neural Efficiency hypothesis, in other words experts develop more efficient processing of essential moves.

There is some evidence that part of the brain known as basal ganglia, interconnected masses of grey matter in the upper part of the brainstem, is believed to be able to send signals to parts of the brain which control movement and also stimulate neurotransmitter release, as well as dopamine release (Gold and Ciorciari, 2020). They report that there is research interest in a mental state in which expertise and flow appear to show a change in the parts of the brain which facilitate a greater allocation of neuronal resources to the visual-spatial process of the right brain. This points to the value

of developing acute vision, in training, reminiscent of a shotgun champion who practiced watching the flight of the target while waiting in line to shoot.

According to the commentary, you cannot just enter flow, it arrives, and the experience is effortless effort. The flow concept is an attempt to explain how, in situations of high challenge when you are calling for extra effort, complex electro-chemical brain wave processes could be brought into play to free additional brain resources. However, "flow" is not essential for high performance.

Does "flow" cause improved performance, or does having a good day, bring on "flow" or does performance and "flow" act to build up each; a reciprocal relationship. Another push factor in high performance is the pressure situation, such as being about to be overtaken by a competitor. This can "lead to increased effort and intensity in pursuing specific goals (Swann et al. 2021). In competitive shooting, knowing or believing that you are behind or that you need to lift performance, can constitute the challenge, referred to in the "Flow State" literature, which brings on an energised state and effortless attention, lifting performance (Bertollo et al. 2016).

The "flow state" is said to be easily lost if one thinks about how well things are going. A high level of skill backed by total immersion in the task is essential for high performance. One cannot step in to the flow zone at will. Can you train for "flow"? If you were to try, then train to make skills automatic, set the training goals to challenge the top level of your current ability and, drive your concentration to the highest level.

Reasons offered to explain the Flow State include the notion of synchronisation of brain activity associated with the shooting task, action supervision and smooth execution (di Fronzo et al. 2016). Top shooters can switch between conscious and automatic modes to correct an error or repond to a novel situation, a malfunction or range incident (Bertollo, and others, 2016). Those who have experienced the Flow State report a loss of the sense of self, for example, firing a rapid fire string during high concentration can seem like watching a movie of perfect actions, even you are aware you are firing, the actions just seem smooth.

As mentioned even though you have the necessary skills, overthinking the shot can make you clumsy. Methods for dealing with distraction include having a particular routine when preparing to shoot which can provide a kind of mental cocoon in which to wrap yourself as you load and prepare for the shot or series. The video of Evglevski shows that his practice routine is almost identical to his preparations on the firing line.

Those with strong visualising capability can fire a complete rapid fire match using mental imagery, assisted if needed, by imitating the skilled actions of an expert (Snelgrove, and Gabot 2020). If using imagery this would be fired in 8-second, 6-second and 4-second timing in full detail, sights centring, trigger action and recoil "felt" as first shot is released on Target 1 and on each remaining target during the traversing across the targets; the follow-through to an imaginary sixth target and back on Target 1.

Case study: Mental practice, personal experience

My preparation for the ISSF Rapid Fire event in the 1968 Olympic trials in Australia, entailed use of mental practice to fire a perfect match (all perfect shots) each day for three weeks before the competition. The preparation included arriving at the venue, car park full, flags flying, being greeted, and visualising moving calmly to the firing point and being fully focussed on the requirements of the event. The mental practice was multi-component as it involved self-talk, the feel of releasing the trigger and occasionally the realism of holding the competition pistol though not lifting it as if to fire. The sessions concluded with visualising ascending an imaginary dais to receive an award, this to create a "winning feeling" said at the time to be a part of building confidence. I had not faced a three-day Olympic trial.

On each day of the trials, I used relaxation to lower pre-match arousal. This was over 50 years ago, well before mental practice became the focus of research although there was indication that athletes were using visualisation in other sports. A film of downhill skiers before the run, showed them clearly enacting the body movements about to be set in motion.

The decision to use mental practice assumed it would help reinforce the skills gained during physical practice without extra wear on the body. Goal-setting in sport as much discussed at the time (1960's) and mental practice offered a means for setting goals since it entailed making perfect shots and had the added advantage of building self-confidence as a barrier against match anxiety.

It is not possible to say whether my second place in the 1968 Olympic Trials (for a two-person team) was due to the physical or the mental practice. I assumed it was both. Concentration was easy during the three-day trials since the mental practice gave practice in concentrating. It was effective because concentration was directed to the essentials for successful performance. Support for mental imagery training increasing concentration was provided by Haryanto et al. (2021). I found that applying concentration was helped during the load period by stepping into a private mental space or cocoon while going through the shot preparation process; a technique also used by Murray (1995).

During the Olympic Trials I experienced a sensation a "Flow State" which corresponded to later descriptions referring to effortless effort. I was involved in a shoot-off for a minor medal in the national championship, in the middle of the trials, in which I was successful by firing a perfect final series ("50"). Shooting the series was like watching a movie of the pistol firing as if on its own with me watching. Another elite shooter reported a similar experience during an Australian State Championship, saying it was as if he was beside himself (Willis, 2011).

Some possible explanations for the successful final series in the shoot-off are: It was the result of extensive mental and physical practice culminating in a "Flow State" (effortless effort, high awareness, faster response time, stimulated by release of neurotransmitters.). Or, it was a result of a pressure situation leading to increased effort and intensity in pursuing specific goals (Swann et al., 2021). The pressure situation was that I thought I was behind, which was true. Or it happened because high concentration was applied to existing skills and the sights fortunately landed on the middle of each target, just a good day!