Using VR to improve free throw percentage in the NBA

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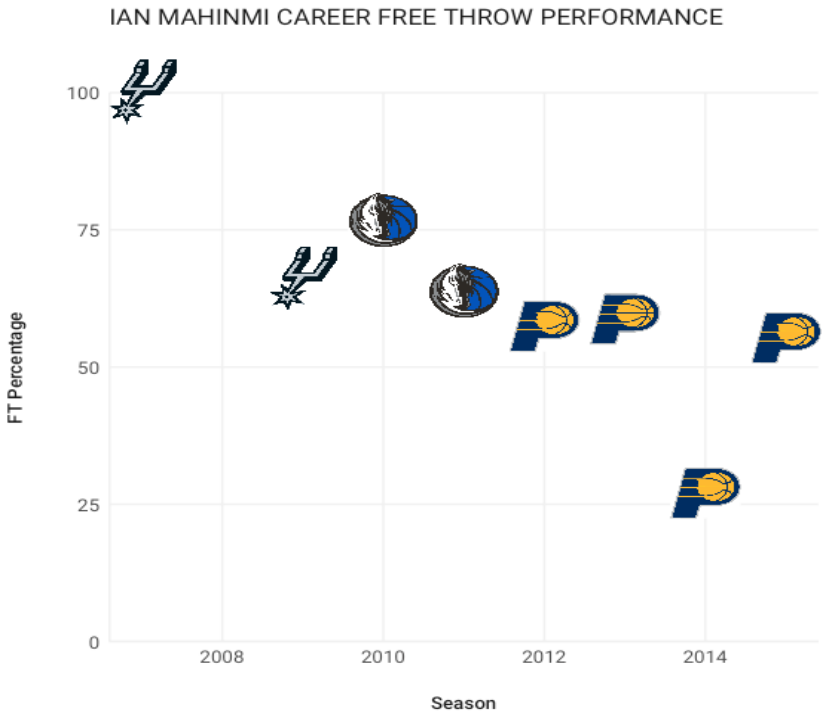
Over the 2016-17 NBA season, the Washington Wizards used STRIVR training to help improve their team's performance on a number of fronts, including the improvement of free throw shooting. To help address free throw shooting, STRIVR developed a free throw shooting visualization tool. We know from neuroscience research on learning that skills improvement is most effective with the right kinds of perceptual input. With STRIVR, we've developed expertise on how to provide the right kinds of tools in order to replicate real-life environments.

One player in particular that seemed to benefit from STRIVR's visualization tool was Ian Mahinmi. Mahinmi is a center who has been in the NBA a decade, winning the Championship with the Dallas Mavericks in 2011. During his time in the NBA, Mahinmi has improved as a player, but his shooting percentages have remained subpar. Going into the last season (2016-2017), he had a career free throw (FT) average of 59.7%[1]. In fact, his FT% has slightly declined throughout his career.



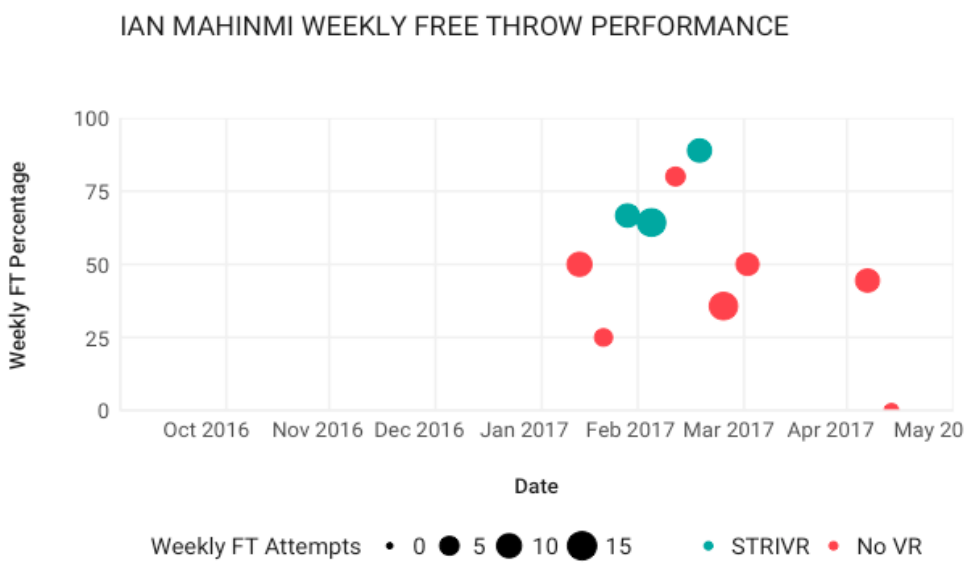
To help boost his free throw numbers, STRIVR worked with Mahinmi to visualize what it looks like when he converts a free throw. This involved Mahinmi wearing a headset to surround himself in an immersive environment, and watch video of himself repeatedly making free throws. With these virtual reps, the player doesn't have to put strain on their body, or even be on a court. The repetitiveness in the life-like immersive setting allows them to internalize the motions, and get the feel of being on the court. We know from a substantial amount of research that visualization works, but how well it works is contingent on how well the 'real-world' perceptual information is represented in the simulation/visualization (Gibson, 1986; Broadbent, Causer, Williams, & Ford, 2015; Goodale, Jakobson, & Keillor, 1994; Milner & Goodale, 2008; Van der Kamp, Rivas, van Doorn, & Savelsbergh, 2008).

Unfortunately, health was an issue in Mahinmi's season; he injured a knee during the preseason, causing him to miss games throughout the year, including the start of the 2016 regular season. He only saw the physical free throw line once before February 2017. Mahinmi returned on February 8, and shot poorly from the FT line for the next couple of weeks.

Mahinmi incorporated STRIVR training for three weeks in late February/March, and averaged a 73% free throw percentage over that period. There was no STRIVR usage for the next few weeks, and Mahinmi's numbers dipped down to below 50% before he sustained a calf injury that sidelined him through the start of the postseason.

He returned on May 7, having logged one day of STRIVR usage during his month-long benching. Over the remaining four games of the Wizards' 2016-17 season, he recorded a 36.4% free throw percentage.

Mahinmi was plagued with injury during the season, but his data points (both in-game free throw data and his STRIVR usage) allow us to get an idea of how STRIVR may play a role in improving player performance. There were 11 calendar weeks that Mahinmi logged game minutes and shot at least one physical free throw. He trained with STRIVR for three of those weeks, averaging 73.3 FT%, while his non-STRIVR weeks he averaged 41.9%. The range in performance difference is large, and although we have a relatively small set of data, the difference is significant when the data are subjected to a two-sample t-test ($t(6.51) = 2.77$, $p = 0.0296$).



We also examined the relationship between the number of virtual reps and physical free throw percentage, and there was no significant relationship between the two (p = 0.1864). What appears to be important is simply the presence or absence of training with STRIVR.

A player's on-court performance is made up of countless factors, many of which are still not well understood. Consequently, it's impossible to account for all of them. Still, the data examined here gives us a compelling reason to believe in the ability of STRIVR's immersive training approach to improve performance. Add to that the research which demonstrates visualization facilitates performance in a variety of domains (Battaglia, D'Artibale, Fiorilli, Piazza, Tsopani, Giombini, Calcagno, di Cagno, 2014; Smith, Holmes, Whitemore, Collins, & Devonport, 2001; Smith, Wright, Allsopp, & Westhead, 2007; Smith, Wright, & Cantwell, 2008) and the growing body of research showing immersive environments can change real-world behaviors (e.g., Bailenson, Patel, Nielsen, Bajcsy, Jung, & Kurillo, 2008; Patel, Bailenson, Hack-Jung, Diankov, & Bajcsy, 2006), and the case for STRIVR becomes even more compelling.

In the short amount of time STRIVR has been around, we've been fortunate to find ourselves data rich. This data provides us with the ability to answer questions like whether STRIVR can facilitate performance, how much STRIVR training is enough, and what type of athletes benefit from STRIVR. As our data sets grow, the ability to produce these key insights grows along with them.

[1] http://www.basketball-reference.com
All other data from NBA API at http://stats.nba.com/stats/playergamelog

References

Bailenson, J., Patel, K., Nielsen, A., Bajscy, R., Jung, S. H., & Kurillo, G. (2008). The effect of interactivity on learning physical actions in virtual reality. *Media Psychology*, *11*(3), 354-376.

Battaglia, C., D'Artibale, E., Fiorilli, G., Piazza, M., Tsopani, D., Giombini, A., ... & di Cagno, A. (2014). Use of video observation and motor imagery on jumping performance in national rhythmic gymnastics athletes. *Human movement science*, *38*, 225-234.

Broadbent, D. P., Causer, J., Williams, A. M., & Ford, P. R. (2015). Perceptual-cognitive skill training and its transfer to expert performance in the field: Future research directions. *European Journal of Sport Science*, *15*(4), 322-331;

Gibson, J. J., & Bray, R. A. (1986). 1979. *The ecological approach to visual perception*.

Goodale, M. A., Jakobson, L. S., & Keillor, J. M. (1994). Differences in the visual control of pantomimed and natural grasping movements. *Neuropsychologia*, *32*(10), 1159-1178.

Milner, A. D., & Goodale, M. A. (2008). Two visual systems re-viewed. *Neuropsychologia*, *46*(3), 774-785.

Patel, K., Bailenson, J. N., Hack-Jung, S., Diankov, R., & Bajcsy, R. (2006, August). The effects of fully immersive virtual reality on the learning of physical tasks. In *Proceedings of the 9th Annual International Workshop on Presence, Ohio, USA* (pp. 87-94).

Smith, D., Holmes, P., Whitemore, L., Collins, D., & Devonport, T. (2001). The effect of theoretically-based imagery scripts on field hockey performance. *Journal of Sport Behavior*, *24*(4), 408.

Smith, D., Wright, C., Allsopp, A., & Westhead, H. (2007). It's all in the mind: PETTLEP-based imagery and sports performance. *Journal of Applied Sport Psychology*, *19*(1), 80-92.

Smith, D., Wright, C. J., & Cantwell, C. (2008). Beating the bunker: The effect of PETTLEP imagery on golf bunker shot performance. *Research quarterly for exercise and sport*, *79*(3), 385-391.

Van der Kamp, J., Rivas, F., Van Doorn, H., & Savelsbergh, G. (2008). Ventral and dorsal system contributions to visual anticipation in fast ball sports. *International Journal of Sport Psychology*, *39*(2), 100.