STRIVR Training Demonstrates Faster and More Accurate Learning Compared to Traditional Study Methods

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Background

For the past two years, STRIVR Labs has led the way in a new and powerful field of human performance training using immersive technologies. To date, STRIVR users have logged thousands of hours of usage across 100,000+ different scenarios in immersive virtual reality (VR) environments. Recent advances in these immersive technologies, particularly in the space of VR, have allowed individuals to experience environments that, up until now, remained inaccessible. For athletes, this means the ability to get on the field more often, examining formations from a first-person perspective, and being able to practice their craft without physically being on the field, court, or ice.

However, up until now, no one has systematically addressed the effectiveness of STRIVR training. Anecdotally, both quarterbacks and coaches alike have endorsed their use of STRIVR, claiming that it has helped their performance (e.g., “Virtual Reality Has a Growing Impact on College Football”, 2017). Internally, STRIVR has demonstrated a trend for at least one STRIVR user to perform better for plays trained with STRIVR versus those trained with traditional film study methods. Many factors, of course, influence a quarterback’s performance on the field. Parceling out the unique contribution of STRIVR would take a relatively large sample of on-field data. Unfortunately, there is often small overlap between the plays trained in film sessions with STRIVR and the plays that actually show up during the course of a game—making it difficult to truly assess the unique contribution of STRIVR training.

Our most recent research effort specifically sought to provide a substantive evaluation of STRIVR training effectiveness. Our results, described in more detail below, demonstrate an advantage for STRIVR training. Importantly, the advantage in reaction times (RT) for STRIVR-trained learners are meaningful enough to matter in the real world. Additionally, STRIVR-trained learners demonstrated an advantage in decision making accuracy over learners trained with Traditional Study methods. This is a very notable result, as it represents the most rigorous evaluation to date to understand the effectiveness of STRIVR training.

Research Evaluation

We engaged 711 learners to participate in the evaluation. Most learners had little to no experience playing the quarterback position. Learners in our research effort were randomly assigned to one of two learning conditions: (1) STRIVR VR training or a (2) ‘Traditional Study’ training method (hereafter referred to as Traditional Study). In both types of training the goal was the same: successfully learn a football concept whereby the actions of a defender indicate what the learner should do. After training, learners in both conditions engaged in a VR assessment to measure the effectiveness of their respective training. The same VR assessment was used for both training conditions.
The learners undergoing STRIVR VR training were given several instances of the concept presented in an Oculus Rift head mounted display (HMD). The instances used in VR training were procured from staged football practice with a major collegiate football program. The practice footage was filmed with spherical video such that, when viewed in the Oculus HMD, learners experienced a 360-degree version of the practice that also allowed them to freely look at any given location at any given time during the training. A voice-over explanation accompanied the HMD training experience that guided the learner towards spatial information that was relevant. In addition, ‘spot shadowing’ was employed to better guide the learner’s training. Essentially, this provided a visual highlighting of the scene to direct attention to relevant visual information on the screen. Meanwhile, the learners undergoing STRIVR 2D training were given several instances of practice featuring the same collegiate football program, but presented on an iPad. The instances used in this case were procured from an existing 2D video library used by collegiate football teams. Voice-over and spot shadows were also included in the 2D training. Each training experience lasted approximately 2 minutes (see Figure 1a).

Following the training phase, learners took part in the VR assessment, presented in an HTC Vive head mounted display. Learners donned the headset and held one HTC Vive hand controller, which allowed them to point and select answers to questions in the virtual environment. The assessment experience was also produced using spherical video clips filmed during the practice of the same collegiate football team. This assessment allowed learners to experience the decision-making process (as taught in the training phase) from the first-person perspective standing on the football field. Three distinct play scenarios were included in this assessment; after each play occurred, a question would be displayed in 3D space in front of the learner: “What should you do in this zone read run play? Give the ball to a running back or keep the ball yourself?” The question presented was also played as voice-over. The learner would then use the controller to select their answer, “give” or “keep.” The entire assessment
experience took approximately 2-3 minutes (see Figure 1b). In the subsequent analysis of the data (presented below), we eliminated questions 2 and 3 from the Assessment. Retrospective debriefs with a sample of learners indicated that the two Assessment questions were flawed, as they contained ambiguous information that would not allow a learner to apply the to-be learned concept in a meaningful way.

Most notable was the substantial advantage in reaction time (RT) that STRIVR trained learners exhibited as compared to their Traditional Study trained cohort. Figure 2 displays the mean reaction time for each Training Condition. Across both questions, STRIVR demonstrated an advantage for reaction times, with STRIVR trained learners responding with a mean RT of 3.01 (sd = 2.43) seconds versus a mean RT of 3.77 (sd = 3.13) seconds for those in the Traditional Study condition. The RT data was subjected to a t-test where we found a highly significant difference between the two groups [t(1, 651) = -3.5925, p<.001]. The STRIVR advantage of 0.76 seconds—or 20%—has very real and important practical implications, as fractions of seconds are the difference between success and failure for quarterbacks (“Sport Science: High-tech QB combine”, 2011) as well as in many other sports. Furthermore, given that individuals in both training groups answered the questions correctly, those trained with STRIVR in VR were 12% faster in getting the correct answer (2.37 seconds for those training in VR vs. 2.69 for those trained with 2D video).
In addition to RT, we also evaluated the accuracy of the decisions made in each Training Condition. Figure 3 displays the accuracy results for each of the Training Conditions. Again, there appears to be an advantage for STRIVR—most respondents correctly made the correct decision, with 81.6% of learners responding correctly as compared to 75.7% for Traditional Study learners. This data was subjected to a Chi-Square test to examine whether the performance difference was significant. The Chi-Square test showed marginal significance for STRIVR \(X^2 (1) = 3.716, p = 0.0539\). This result demonstrates that learners in the STRIVR training condition were more likely to successfully acquire relevant football knowledge that using Traditional Study methods.

The results from our evaluation are in line with what we have observed with STRIVR-trained quarterbacks over the past two years, with some quarterbacks going so far as to claim outright that STRIVR directly helped their performance (“A New Reality: Texas Tech Sees Virtual Reality System to Enhance Film Study”, 2017).
Discussion

The results presented here represent the most rigorous demonstration to-date of STRIVR training’s ability to facilitate football-relevant learning. Critically, the RT performance advantage observed for STRIVR training compared to traditional study methods provides a reason to believe STRIVR training may actually lead to meaningful, real-world performance improvement. Moreover, our evaluation collected data from over 700 learners, making it the largest known systematic evaluation of VR training.

As noted at the outset, there are likely several ways in which VR facilitates performance. The first is providing perceptual information that is sufficiently similar to what is experienced in real life (Chun & Jiang, 1998; Fiser & Aslin, 2001; Oliva & Torralba, 2007). While learning may occur for training methods employing perceptually dissimilar information (e.g., film study), this learning is less likely to transfer to the football field than if the information is presented from a relevant perspective (e.g., first person). Relatedly, the second way in which STRIVR facilitates performance is through the use of 3D visualization. 3D visualization has been shown to promote learning of concepts, particular ones that critically require an accurate visuospatial model, more effectively than 2D visualization (Wu & Shah, 2004). Finally, having the ability to view the same object information from multiple perspectives (e.g., a wide receiver) facilitates the ability to recognize that object from a new perspective, as often happens when the play appears during the course of a real game (e.g., Wallis & Bülthoff, 1999). With STRIVR, allowing the quarterback to freely view a play with six degrees of freedom in head movement will help provide those multiple perspectives.

It should be considered that engagement may play a critical role in driving performance differences in our evaluation. Motivation is known to play a facilitative role in learning (see: Maddox, Gorlick, & Worthy, 2015). Though no formal data was captured regarding the engagement of individuals during training, it may be the case that greater engagement with STRIVR training as compared to Traditional Methods may be a driving force in the advantage observed with our current data. Data that speaks to this point is forthcoming.

Limitations and Future Directions

While the results presented represent a first and critical first step along the path of understanding STRIVR effectiveness, we have undertaken more research efforts to ensure the robustness of this result. In addition to the results presented here, we have initiated parallel evaluation efforts to more thoroughly understand STRIVR effectiveness using similar training and assessment paradigms with current STRIVR users. These assessments more broadly test the types of information that may benefit from STRIVR training. That said, the results presented here provide an important first step towards understanding whether STRIVR can positively impact performance training in a meaningful way.

There is a growing body of research demonstrating that learning via VR may have greater real-world impact versus traditional methods of learning. Learning through a more enriched sensory experience, learning with a perspective that matches the real-world use case, and creating an experience that is more motivating are all ways in which VR can enhance learning. These are quite possibly the same reasons STRIVR exhibits a performance advantage over Traditional Study techniques and continues to be valued by organizations as a learning tool both in athletics as well as other arenas of training.
References


