LASER SHOT®

FIREARMS SIMULATION STUDY

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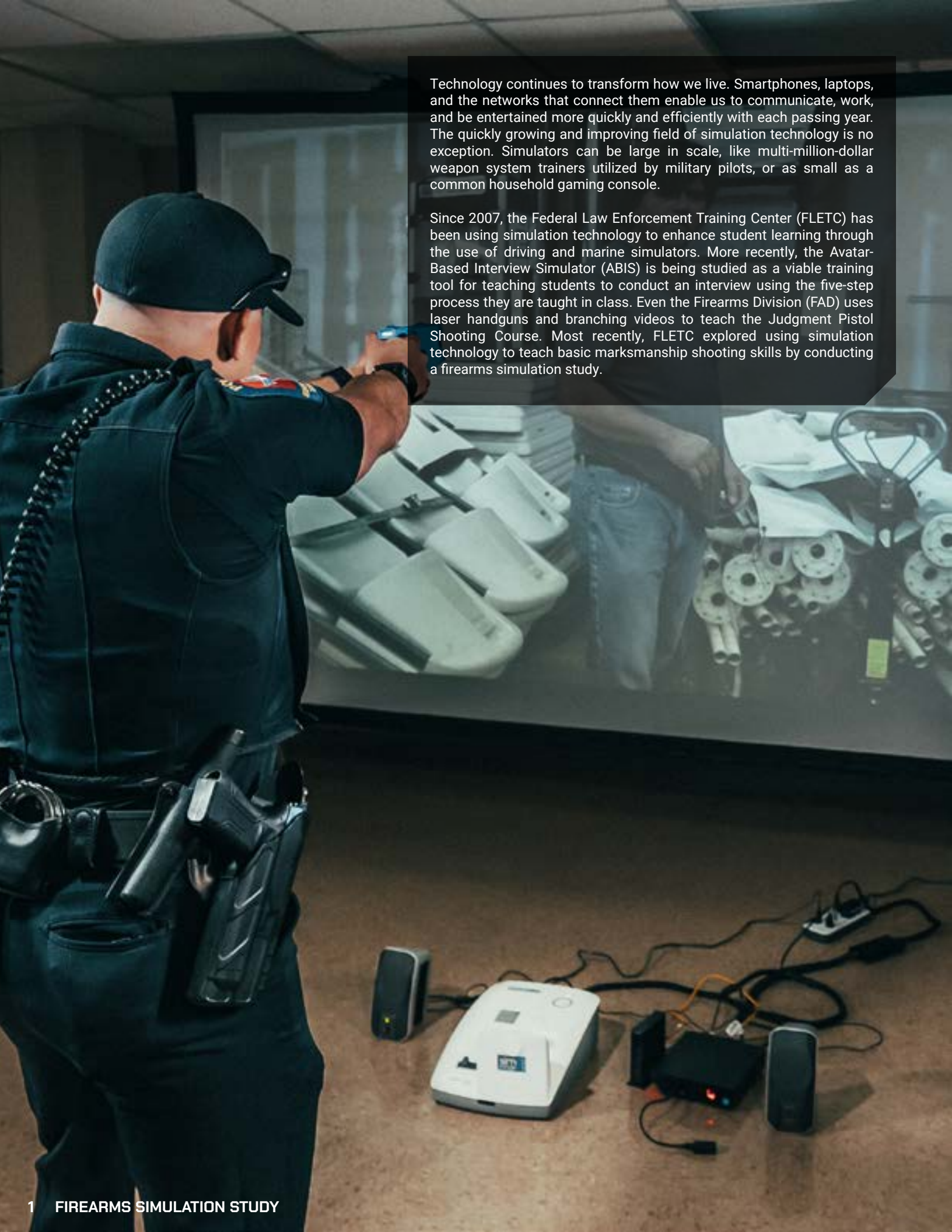

Technology continues to transform how we live. Smartphones, laptops, and the networks that connect them enable us to communicate, work, and be entertained more quickly and efficiently with each passing year. The quickly growing and improving field of simulation technology is no exception. Simulators can be large in scale, like multi-million-dollar weapon system trainers utilized by military pilots, or as small as a common household gaming console.

Since 2007, the Federal Law Enforcement Training Center (FLETC) has been using simulation technology to enhance student learning through the use of driving and marine simulators. More recently, the Avatar-Based Interview Simulator (ABIS) is being studied as a viable training tool for teaching students to conduct an interview using the five-step process they are taught in class. Even the Firearms Division (FAD) uses laser handguns and branching videos to teach the Judgment Pistol Shooting Course. Most recently, FLETC explored using simulation technology to teach basic marksmanship shooting skills by conducting a firearms simulation study.

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AT FLETC a basic student's first exposure to the use of handguns is in the Basic Marksmanship Instruction (BMI) course. BMI includes basic weapons handling skills, including stance, grip, sight alignment, and trigger control. So, in partnership with the FAD, the Training Innovation Division (TID) began looking at various Firearms simulators for the study.

One such simulator is Laser Shot's "FLETC Course of Fire." As an enterprise supplier at FLETC, Laser Shot products are used by the FAD in the Judgment Pistol Shooting Course and by the Driver Marine Division (DMD) in marine boat boarding training. Laser Shot's "FLETC Course of Fire" accurately simulates what a real range looks like, including targets that move, turn, and face for specific time intervals. In addition, Laser Shot's "FLETC Course of Fire" can display practically any target while accurately simulating target size at various distances. Finally, the Laser Shot "FLETC Course of Fire" can easily be set up in a large classroom.

Next, the TID and FAD began looking at various styles of handguns. Essentially, there are two styles of handguns available; those with recoil and those without recoil. Research by the U.S. Army indicates that recoil is not necessarily required to teach Basic Marksmanship (Smith & Hagman, 2000). Other research has found that though the technology of simulating recoil has advanced, it's not always reliable, and can actually hinder training (Grant & Galanis, 2009). This is especially true when using a system which requires the weapon to be tethered to a canister that is attached to the shooters belt and supplies the carbon dioxide gas necessary to simulate recoil. Untethered systems, which incorporate carbon dioxide gas canisters into the magazine are available; but at this time, they are also cost prohibitive.

Based on these findings, TID decided to first conduct research using a handgun without recoil. Specifically, TID, in concert with FAD, decided to use a Glock 17 R with a resetting trigger. Each Glock was fitted with a laser insert that would fire an invisible infrared laser each time the trigger was pressed. Therefore, the basics of stance, grip, sight alignment, and trigger control would be similar to dry firing a real weapon. However, a major advantage over regular dry fire is that the Laser Shot system provides immediate feedback as to shot placement.

Though basic students enrolled in the Criminal Investigator Training Program (CITP) start out in BMI, their real goal is to shoot a qualifying score at the end of the Semiautomatic Pistol Course (SPC). After attending BMI, students receive 18 hours of SPC instruction. At the end, students shoot the FLETC SPC Course of Fire and must achieve a qualifying score of 210 out of 300 possible points. Therefore, the real question to be answered is whether or not the final qualifying SPC score of those using a laser handgun in BMI is significantly different from the final qualifying SPC score of those using a live-fire handgun in BMI.

To answer this question, TID approached the College of Coastal Georgia (CCGA) about allowing college students to participate in the Firearms Simulation Study. Once approved, TID staff and FAD instructors met with CCGA students majoring in Criminal Justice. As a result, 14 college students initially volunteered to participate. Students were then stratified based on criteria including age, gender, and prior experience with a handgun. The students were then randomly assigned to one of two groups, those who would use a laser handgun in BMI, and those who would use a live-fire handgun in BMI. All instruction was conducted in accordance with FAD lessons plans and by FAD instructors. After completing BMI, all students participated in the FLETC SPC course of fire. Due to the time constraints of the CCGA semester system, SPC instruction was limited to only 14 hours rather than the normal 18 hours.

After completing SPC instruction, students shot a final qualification round. The average SPC qualifying score for those college students who trained in BMI with a laser weapon was 257.8. The average SPC qualifying score for those who trained in BMI with a live-fire weapon was 260.4. Average scores for each group beginning with SPC-4 are shown in Chart 1, below. Though there was only a 2.6 point difference, 14 participants were not enough to draw a conclusion about whether or not the difference was statistically insignificant. However, the results were strong enough to suggest that the FAD and TID staff approach Partner Organizations about allowing their students to participate in the study. (To that end, the FAD and TID want to thank the United States Marshals Service (USMS) for volunteering three classes of their students enrolled in the Criminal Investigator Training Program (CITP) to participate in the study.) This allowed for a total of 140 students to be assigned to either BMI using a laser handgun or to BMI using a live-fire weapon.

As with the college students, the USMS CITP students were stratified into groups based on age, gender, and prior Law Enforcement or Military experience which included training on the use of a handgun. The students were then randomly assigned to either train in BMI with a laser handgun or with a live-fire Glock 22 .40 caliber handgun. Specific demographics for each group are shown in Table 1, page 5.

As with the college students, all instruction was conducted in accordance with FAD BMI and SPC lesson plans. Rod Burnett and Kevin Erdmier served as the lead instructors with FAD staff providing all class and line instruction. Given that these were regularly scheduled training sessions, the full 18 hours of SPC instruction was provided using the Glock 22. Those who used a laser weapon during BMI training shot a SPC average qualifying score of 275.8. Those who used a live-fire weapon during BMI training shot a SPC average qualifying score of 278.2. An independent t-test found this difference to be statistically insignificant. Average scores for each group during the last seven SPC sessions are shown in Chart 2, on page 5.

To determine if the students in the research study performed differently than students who receive routine firearms training, data was compared to the three previous USMS CITP SPC classes. These USMS CITP classes were used as the control group. In total, 138 students in prior classes who trained with a live-fire handgun in BMI shot a SPC average qualifying score of 275.8. This is the same average as those who trained with a laser handgun in BMI. Data analysis indicated that differences between the control group and the study group were statistically insignificant. See Table 2 on page 5 for a summary of SPC qualification scores.

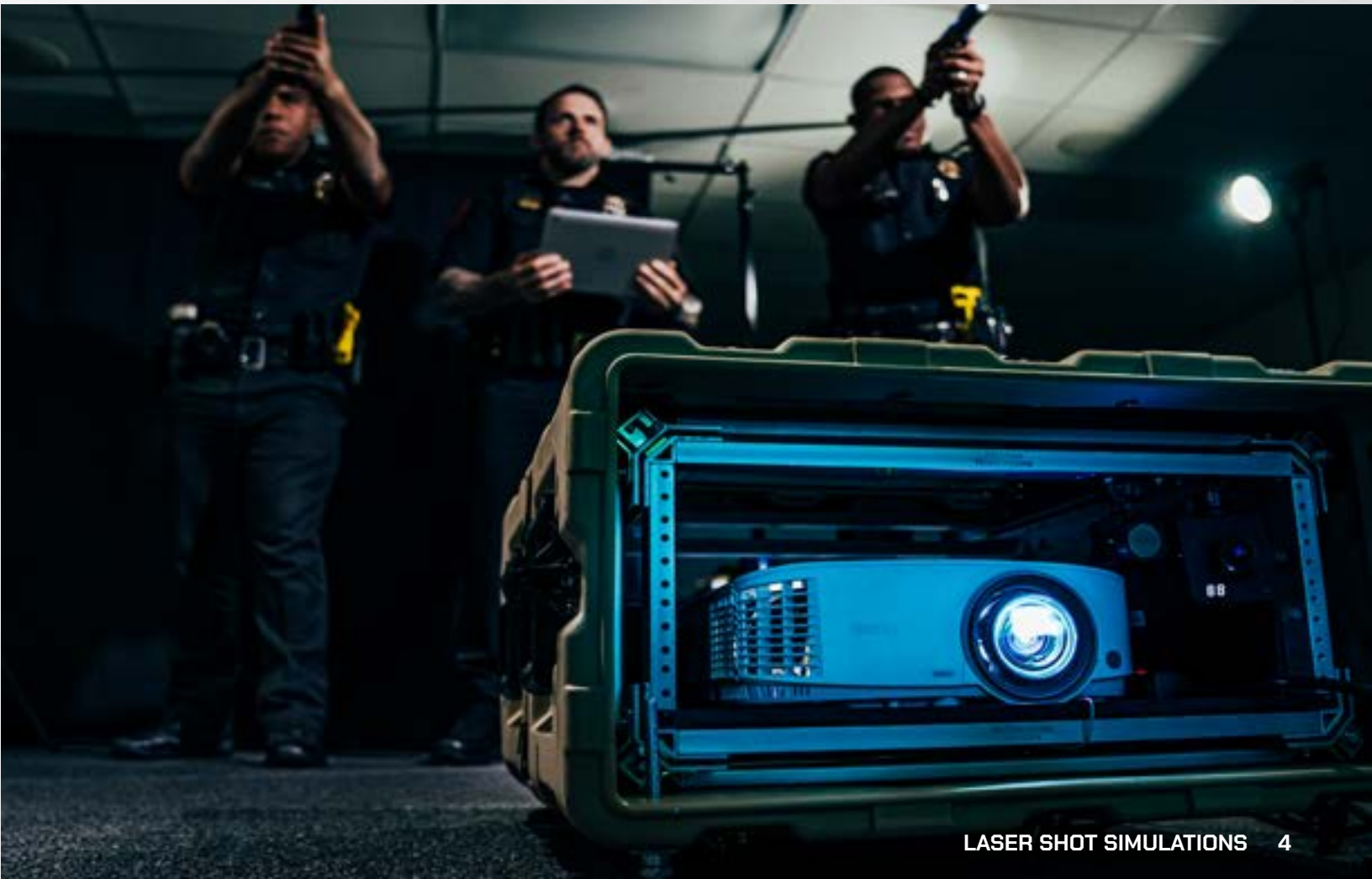
The students with prior military and/or law enforcement firearms training who trained with a laser handgun in BMI shot an average SPC qualifying score of 280.1 compared to an average SPC qualifying score of 282.5 for those who trained with a live-fire handgun. These differences were also statistically insignificant. Those with no prior military and/or law enforcement firearms training who trained with a laser handgun in BMI shot an average SPC qualifying score of 265.0 compared to an average SPC qualifying score of 266.8 for those who trained with a live-fire handgun in BMI. Again, these differences were statistically insignificant. These results are presented in Table 3, page 6.

Based on the score a student shoots, they are given one of five possible classifications. Scores below 210 are classified as "Did Not Qualify," scores from 210 to 254 are classified as "Marksman," scores from 255 to 284 are classified as "Sharp Shooter," scores from 285 to 299 are classified as "Expert," and a score of 300 is classified as "Distinguished Expert." Results by category are shown in Table 4, page 6. Though there is some variation within each classification, based on the BMI training method, no statistical differences were found. All students in the study group who "Did Not Qualify" were provided with four hours of live-fire handgun training on BMI; subsequently, they shot a qualifying score during the reshoot.

As mentioned before, all training was done in accordance with the applicable lesson plans. However, those training with the laser handguns during BMI did not need to wear hearing protection. This allowed instructors to carry on normal conversations while instructing students in the proper stance, grip, sight alignment, and trigger control. Students could freely ask questions and get answers without having to "yell" or "read lips." One instructor commented that because he could get "up close and personal," he was able to see errors in weapon handling, especially in respect to grip and trigger press, that he would not have normally been able to see. Other benefits include both a reduction in ammunition usage, accompanying cost savings associated with range maintenance, and in freeing up valuable range time. This additional range time could then be used to teach more advanced live-fire courses and/or increase the through-put of basic training classes. Furthermore, since BMI using a laser handgun can be taught in a large classroom, those without an indoor range can still train no matter what the weather conditions might be outside.

If a laser handgun is to accurately simulate a live-fire handgun, the impact of recoil must be considered. As mentioned before, there are recoil systems that incorporate carbon dioxide gas cylinders into the magazine. When the trigger is pressed, gas is released causing the slide to operate. This also forces a student to reacquire their sights. Some of the more advanced simulated handguns can even be programmed to simulate a weapon malfunction that can be cleared by the "Primary Immediate Action" procedure and emergency reloads. However, even the best simulated weapon with recoil cannot simulate the concussion blast of a live-fire handgun. Still, future research should be designed to incorporate simulated recoil and should seek to partner with other agencies in order to evaluate the success rate with the full range of FLETC students.

In conclusion, it does appear that the CCGA students and the USMS CITP students training with a non- recoil laser handgun in BMI achieve statistically similar SPC qualification scores that students training with a live-fire weapon achieve. In addition to the potential cost savings, laser handgun BMI training offers several instructional advantages and also provides a safer environment than live-fire. In the end, nothing will ever replace actual live-fire or "putting rounds down range." However, several studies, to include the FLETC Live-Fire/Simulation Study, seem to indicate that firearm simulation is a viable approach to certain introductory phases of marksmanship training and is on the verge of becoming a valuable tool in both the teaching and learning of psychomotor skills.



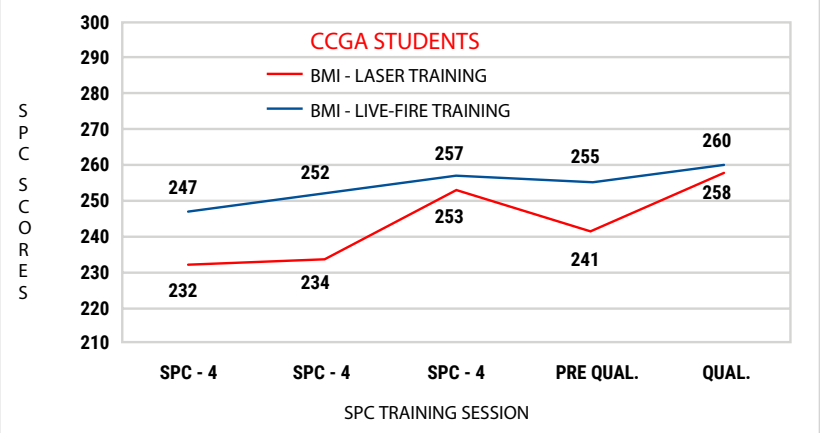


CHART 1

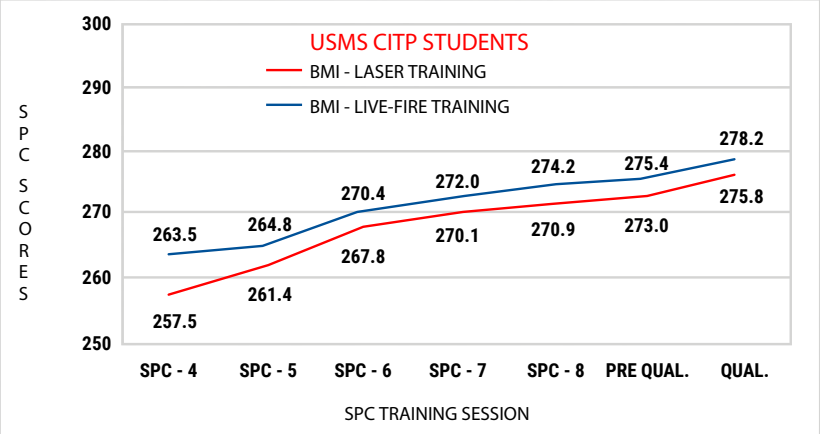


CHART 2

- Grant, S. C., & Galanis, G. (2009). Assessment and prediction of effectiveness of virtual environments: Lessons learned from small arms simulation. In Cohn, J. & Nicholson, D. & Schmorrow, D. (Ed.) The PSI Handbook of Virtual Environments for Training and Education, Volume 3, Integrated systems, Training Evaluation, and Future Directions, Westport, CT.

- Smith, M., & Hagman, J. (2000). Predicting Rifle and Pistol Marksmanship performance with the Laser Marksmanship Training System (Tech. Rep. 1106). Alexandria, VA: U.S. Army Research Institute for the Behavioral Sciences.

FIREARMS PARTICIPATION STUDY DEMOGRAPHICS

BMI TRAINING METHOD	GROUP SIZE	AVERAGE AGE	MALES	FEMALES	NO PRIOR EXPERIENCE	PRIOR EXPERIENCE (MILITARY OR LE)
LASER	70	29	59	11	20	50
LIVE-FIRE	70	30	61	9	19	51

TABLE 1

SPC QUALIFICATION COURSE

BMI TRAINING METHOD	STUDY GROUP	USMS CITP CONTROL GROUP
LASER	275.8	N/A
LIVE-FIRE	278.2	275.8

TABLE 2

SPC QUALIFICATION COURSE

BMI TRAINING METHOD	NO PRIOR EXPERIENCE	PRIOR EXPERIENCE (MILITARY OR LE)
LASER	265.0	280.1
LIVE-FIRE	266.8	282.5

TABLE 3

	BMI TRAINING METHOD		3 PRIOR CITP
SPC CLASSIFICATION	LASER	LIVE-FIRE	LIVE-FIRE
DID NOT QUALIFY	2.9%	0%	0.7%
MARKSMANSHIP	10%	7.1%	10.9%
SHARP SHOOTER	48.6%	47.1%	50.8%
EXPERT	34.3%	37.1%	35.5%
DISTINGUISHED EXPERT	4.3%	8.6%	2.2%

TABLE 4

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