Operation D.A.R.T. (Designing Augmented Reality for Transfer) Improving preparedness for Basic Combat Training Candidates

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ABSTRACT

This paper examines the findings of a master's thesis which explored the theory and design considerations of effective learning applications built with Augmented Reality (AR). The purpose of this study was to explore the possibilities to better prepare Basic Combat training candidates for the tasks and stressors associated with training. The research questions focused on the evaluation of learning outcomes, emotional experiences, and transfer results compared between traditional multimedia material and a multimodal AR application designed and developed for this study. A primary interest is to discover if informal learning can prime basic training candidates for the rigors of basic training and increase their successful completion. A mixed-methods, between-subject research design was executed as a pilot study (n = 10). Two groups were compared. The control group (n = 5) represented the standard educational practices that use multimedia slides, and the experimental group (n = 5) introduced a novel-AR App. A variety of instruments were used to measure declarative knowledge, conceptual knowledge, procedural task knowledge, and emotional states, followed by a time delayed transfer test on the same outcomes. Results that were evaluated using nonparametric statistics show there are no statistical differences in actual learning or transfer between the two groups but that there are strong trends in perceived learning, perceived stress, homesickness, rankings regarding the utility of AR, and subjective evaluation (immersion, engagement, and perceived learning). Interesting correlations were found to be different between the AR and the control conditions that may inform the use of technology in training applications and design. Qualitative data was gathered using interviews, think-aloud protocols, and field notes. This quantitative data combined with qualitative evidence supports further study with an increased sample size to better evaluate immersive learning application design.

Keywords: Augmented Reality, Augmented Reality Basic Combat Training Environment (ARBCTE), Attrition, Basic Combat Training (BCT), Cognitive Theory of Multimedia Learning (CTML), Informal Learning, Preparedness, Self- Directed Learning, Stress, Transfer.

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INTRODUCTION

Origins of Operation D.A.R.T.

In Spring 2024, a master's thesis codenamed Operation D.A.R.T. (Designing Augmented Reality for Transfer) was conducted as a means of exploring reasons Basic Combat Training attrition, crafting an approach using informal learning solutions and evaluating said approach used a mixed methods/posttest/control group design. This project consisted of multiple phases. Firstly, it isolated the cause of attrition and recommended a viable solution for meeting the needs of the everyday interested person. Secondly, it created a platform to deliver this stress and task preparation. Lastly, this initiative tested the design and impact of the platform using real world subjects.

Military Culture and Basic Combat Training (BCT)

The Military, as an organizational culture, comes with its own fair share values, beliefs, and artifacts (Schein, 2010, pp. 23-32). This culture to the untrained eye may seem strange, unfamiliar and in some cases stress inducing. Basic Combat Training acts as the initial training mechanism for most Soldiers serving within the Army. It is here that we can observe these culture mismatches between the Soldiers and the culture of the Army (U.S. Army, n.d. -a). The Army Values, Army Profession, marching techniques, learning ranks, paygrades and the chain of command all embody the Army's Organizational culture and may not necessarily reflect the cultures and or upbringings of the BCT candidate.

Current Solutions

Opportunities to acclimate candidates to the military culture exist in formal traditional methods but in most cases require access given from the stakeholder and do not benefit individuals that are seeking basic information before deciding to join or begin the process of joining the military. I define this character as the *"everyday interested person" (Webb, 2024, pp. 1).* Examples of such programs are the JROTC-Junior Reserve Officer Training Corps and ROTC- Reserve Officer Training Corps program(candidates do not attend BCT), futureSoldiers.com and Future Soldier Preparatory Program (Loten-Beckford, 2022; U.S Army, n.d. -b, -f; US Army JROTC, 2024).These programs are all highly effective in formal settings with people that have already decided to join the Army, but do not provide the accessibility and transparency necessary for the *everyday interested person.* This lack of preparation could lead to attrition for candidates that join without having prior access to the military culture. Military stakeholders need to get the right person for the job and have a greater understanding of the culture, including the tasks and stressors associated with BCT. Not providing transparency and expectancy could lead to unintended consequences, namely attrition.

Attrition

Attrition occurs for many reasons ranging from issues that existed prior to service, failure to adapt, and even psychological issues. (USACIMT, 2023ab). These causes were primarily provided by the Center for Army Initial Military Training. This organization is responsible for training during the initial stages of Soldiering. They are also directly accountable for briefing and mitigating attrition.

U.S. Army Attrition impacts three distinct audiences. The first is the military itself, which enlists persons against specific military occupational specialties (i.e., jobs). If someone attrits from BCT, then there is one less person to do the job assigned. Secondly, as DOD gets its budget from the taxpayers by way of congress it can directly affect the American Budget. (Office of the Under Secretary of Defense (Comptroller), 2022). If you estimate that it costs 55-75 thousand dollars to train a Soldier and that roughly 8 percent attrite, this could easily be 501–674-million-dollar issue (Kimmons, 2018; USACIMT, 2023b). Lastly, as 71 percent of the youth are not available to serve for various reasons with only 1 percent of the American population currently serving, attrition affects the society as well (U.S. Recruiting Command, n.d.).

LITERATURE REVIEW

To analyze and understand the complexity surrounding BCT attrition, a comprehensive literature review was conducted using over 80 interdisciplinary works from fields ranging from educational psychology, informal learning, computer science and instructional design. To further organize our thoughts, we created interdisciplinary buckets which manifested in the form of seven questions aimed to identify and explain the problem along with tentative solutions. The questions are explored below.

1) Why Does Basic Combat Training Attrition Occur?

Military experiences can encourage stress and anxiety. These stressors can be brought on from a variety of reasons such as family considerations, tasks that Soldiers are asked to do or even whether they enjoy their job in the first space (Hruby et al., 2021). There is also evidence that suggests that these stressors could negatively impact performance (Harris et al., 2005).

Other reasons for attrition are professionally researched. Some researchers suggest that there are correlations between stress and workload and effects on injury and sleep. Additionally, psychological stressors and anxiety may have a negative impact on discharges (Tait et. Al, 2022). Whatever the reason, attrition at its core, is a result of a lack of adjustment and failure to perform in a manner that meets the requirements.

BCT serves for many as the first opportunity to experience these stressors firsthand. For example, Soldiers may experience yelling, homesickness, and or a general lack of privacy (Williams et al., 2016). It is easy to imagine that a declined performance based off the inability to cope or deal with the various stressors could lead to attrition. It should be no surprise based off what is at stake that IET attrition is a topic that over the years has gained significant attention (Gubata et al., 2012; Marrone, 2020; Weber et al., 2022). For this project, we relied primarily on the information provided by the Center for Initial Military Training which tracks various metrics associated with attrition (United States Army Center of Initial Military Training, n.d.) USACIMT attributes attrition to a variety of reasons to include issues that existed prior to service, failure to adapt, behavior issues, misconduct, and other physical and mental conditions not previously covered. (USACIMT, 2023ab). Over the years, and maintaining goal of 12 percent attrition rate, USACIMT has reported favorable numbers for both the attrition rate which decreased from 6.41 to 6.14 percent (October 22 to September 23) and the discharge rate which has fluctuated over the years with the lowest recent number reported as 8.0 percent in FY 21 (USACIMT, 2023ab). However, as the stakes are high, any decreases in attrition are warranted.

2) What Does This Have to Do with Stress and Anxiety?

Stress and anxiety are important aspects of understanding BCT attrition. They represent the psychological impacts of the external stimuli given by the military and by extension BCT experience. The Army actively seeks to mitigate these stressors with programs provided by its Ready and Resilient Campaign which includes a variety of programs

such as its Master Resiliency program, Military One Source, Army Substance Abuse Program and Sexual Harassment/Assault Prevention, Equal Opportunity, and chaplain services (Department of the Army Chaplain Corps, n.d.). Military One Source, n.d., U.S. Army Directorate of Prevention, Resilience and Readiness, n.d.).

Stress can be understood as a psychological response to something in the environment or in other words an "increased sympathetic arousal" (Maddi and Kobasa, 1984, as cited by Funk, 1992, p.338). It can also be understood as a threat, loss/ perceived loss of resources- which represent various capacities such as time or status, or mismatched effort when considering the resources expended (Hobfòll, 1989).

One way that anxiety can be viewed is through the lens of the interaction hypothesis, which asserts that trait anxiety (predisposition with dealing with anxiety-normal responses) can be used as a predictor of how a person performs in real time (state anxiety) (Edwards and Trimble, 1992).

Other relevant constructs related to anxiety include coping and hardiness. Coping can be avoidance based, emotion-oriented or problem-oriented implying that people handle situations differently (Lazurus and Folkman, 1984; Edwards and Trimble, 1992). Hardiness represents the individual's ability to use experiences from their upbringings and life to deal with a situation. Hardiness may imply that a person looks at a situation as being heavily committed to it, seeking to control it, or a challenge. (Funk, 1989; Florian et al., 1995; Hystad et al., 2015; Maddi and Kobasa, 1984). In short, stress, anxiety, coping a hardiness express the individual differences that inform a person's response within a situation. Understanding these differences is the first step to identifying and crafting viable solutions.

3) How Have Psychological Stressors Been Measured Traditionally In BCT?

Martin et al. (2006) conducted at Fort Jackson aiming to understand the role of ethnicity, gender and stressors. A hypothesis not proven. In contrast, Datel and Lifrak (1969) used an experimental film that showed various stressors within BCT seeking to validate a stress inoculation hypothesis. Although both studies differed, they both conclude that Soldiers adjust prior to training. Both studies were conducted after candidates arrived at BCT. This approach highlights an important fatal flaw found within both studies. Research on stressors and performance should occur prior to soldiers arriving to both provide preparation to the Solider and to measure the effectiveness of said preparation.

4) What General Solutions to Stress and Task Preparation Exist?

Research suggests there are some general methods that could help prepare candidates for BCT. First, there is a need to manage expectancy. Janis (1958) suggests that effectively providing psychological communication about an event can lead to better outcomes and better coping in situ. Secondly, there are individual differences that if understood could allow better prediction of performance. Put another way, understanding a person's attitudes, intentions, beliefs can better predict behavior. (Ajzen, 1991). This in conjunction with the individual differences already discussed (anxiety, coping hardiness) could strengthen understanding. There is also a need to find the right approach. Stress preparation could be done in several ways such as phased, graduated intensity, or customized (Friedland and Keinan, 1992). Understanding which method is appropriate is important. Lastly, research suggests that timing matters. As previously outlined, it must occur prior to BCT and must reflect the "culture shock" that the BCT experience provides (Datel and Lifrak, 1969, p. 871).

5) What New Approaches Have the Potential to Complement and Enhance the Already Established Formal Programs Within BCT?

The limitations that prohibited Martin et al. (2006) and Datel and Lifrak (1969) no longer exist. This is due to informal learning technologies which are vastly accessible and intuitive. Informal learning provides opportunities for self-directed learning, engagement and motivation (Pérez-Álvarez et al., 2018, Song and Bonk, 2016; Zimmerman, 1989). As informal learning opportunities are considered, AR provides one of the most accessible and transparent informal learning mediums.

6) What Are the Benefits of Such an Approach in Both Theory and Affordances?

AR has a solid foundation in both theory and affordances. As it relates to theory, AR can be viewed under the lens of the situated learning or constructivist theory, which involves learning within context and specific meaningful situations and tasks respectively (Lave and Wegner, 1991; Dunleavy and Dede, 2014).

Additionally, AR can be understood through a variety of information processing theories such as dual coding and cognitive theory of multimedia learning (Paivio, 1975, 179 -211; Mayer, 2021, pp. 55-72). The dual coding theory attributes learning as the work of a verbal and image system which works to make sense, code, store, and retrieve information. The Cognitive Theory of Multimedia Learning (CTML) expands upon this theory. "CTML posits that multichannel information is received through dual audio and visual channels. Next the information is imported within the sensory memory and selected which is the process of getting the necessary information. The information is then organized which implies that the human is making sense of the information within the working memory. Lastly, the information is integrated which is defined as recalling information through schemas within the long-term memory" (Mayer, 2021, pp.57-72 as cited in Webb, 2024, p. 24)." This model helps to understand how AR works.

AR also has several notable affordances typically associated with digital learning technologies to include freedom of choice, interactivity, non-linearity and adaptivity (Graesser at al. 2022). Other affordances include the ability to leverage special relationships through an embodied and present experience (Kilteni et al., 2012; Genay et al., 2022).

As a design concern, it is important to understand that the biggest threat to AR's efficacy is cognitive overload which results when multiple cognitive resources compete when digesting essential and extra material or in other words over stimulation (Mayer and Moreno, 2003 and Mayer 2021).

7) How Can One Craft a Feasible Solution to Solve This Problem?

We argue that there are three steps that would be useful in crafting a design that better prepares candidates for the stressors and tasks at BCT. Firstly, we should capitalize on the relationship between self-regulation, interest, and motivation. Sansone (2019) argues that motivation is important to begin the task, interest is needed to encourage the learner to continue. Additionally, motivation and self-regulation can be leveraged to encourage learners to create unique learning experiences (Sansone, 2019). Secondly, we should ensure rehearsals are available as a medium to encourage transfer. Examples of this approach can be observed within the UCF sponsored TeachLive program which seeks to better prepare teachers by giving them rehearsals in the virtual space (Dieker et al., 2019). Lastly, as a design criterion, we must mitigate cognitive overload by understanding applying mitigating techniques such as segmenting material (Mayer and Moreno, 2003).

The seven questions provide understanding of the problem and tentative solutions. Military persons are exposed to a variety of stressors that begin at BCT. Measuring these stressors has often been done after the candidates arrive and this is a mistake. Informal learning through AR can be used as a medium to better prepare candidates for stressors. This is supported in both theory and affordances. We can design experiences that help to promote transfer and decrease stress, anxiety, and homesickness. However, there were no studies that put this all together. Operation D.A.R.T. was an initiative to close this gap of knowledge. What follows is a discussion of the research design and study conducted in support of this initiative in the fall 2023 and spring of 2024.

METHODOLOGY

Overview

A pilot study, to test the instruments and data collection plan was designed as mixed methods, between subjects a pretest/posttest control group design with N=10 (0= control condition and 1= experimental condition). This

experiment used several instruments to gather data such as pre/posttests, pre/post surveys, a proven psychological survey (perceived stress scale- popular scale that uses ordinal data to calculate stress) and a think-aloud task analysis (State New Hampshire Employee Assistance Program (n.d.). This experiment aimed to measure declarative,

conceptual and procedural tasks about various tasks and stressors associated with BCT and attitudes and rankings regarding to a variety of topics associated with the BCT experience, stressors, concerns, and interest in BCT. The primary objective was to measure the transfer effect of the AR condition. The secondary objective is to compare the two conditions. The subjects were representative of UCF students that were over 18, could read speak and write English and had normal vision and hearing. Additionally, these candidates were ideally not familiar with the training material. This sample of convenience were recruited using flyers, emails, word of mouth and listservs. Once the subjects expressed interest, they were randomly assigned into one of the two groups and emailed additional details regarding the study. This study was approved by the UCF IRB under IRB Number: IRB00017950. The research questions are listed below.

Research Question #1: Is there a difference in learning by condition? Ho: There is no difference between learning (percent changed between pre and posttest) between the two conditions. AR = Multimedia Slides (i.e., Google Slides)

Research Question #2: Is there a difference in subjective evaluation by condition? Ho: There is no difference between immersion, engagement, and perceived learning (postsurvey results) between the two groups. AR = Multimedia Slides (i.e., Google Slides)

Research Question #3: Is there a difference in transfer by condition. Ho: The findings will show that there is no difference in transfer (task analysis-error count). When measuring the effects of transfer, AR = Multimedia Slides (i.e., Google Slides)

Materials

For the experimental condition, a novel AR app named the Augmented Reality Basic Combat Training Environment (ARBCTE). The ARBCTE was created using a combination of 2D/3D images, text, audio clips and GIFs. This was created using Adobe Aero and various resources from the internet to produce the material within the AR space. (Adobe, 2023, SketchFab, 2024) This AR environment showed various declarative, conceptual and procedural tasks, stressors, and resources associated with Basic Combat Training. The educational content was based off Army related sources found on the internet to include but not limited to the Soldiers Guide- TC 721. 13, ACFT requirements, and Drill and Ceremony. The ARBCTE was designed with several goals in mind (HQ, US Department of the Army, 2015, 2021; US Army (n.d., -d). Figures 1 and 2 provide visuals of the experimental condition.

1. To provide the educational content: Information about BCT (i.e., understanding and/or applying: rank structure, Army values, Army physical fitness, Army history, Army's stance on inequality, stressors commonly associated with BCT, resources found at BCT, basic marching maneuvers and customs and courtesies)
2. To provide transfer opportunities from the virtual world to the real world.
3. To provide realistic expectations for users within the simulation.
4. Inoculate against negative emotions/ stressors.

Figure 1. ARBCTE Level Example   **Figure 2. Experimental Condition Intervention**
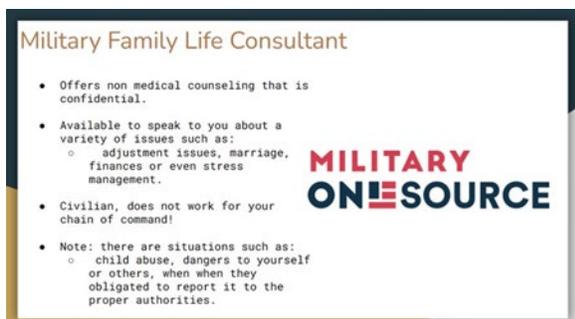
Figure 3. Example of Multimedia (Google Slides)

For the control condition, a multimedia online slide deck was created using Google Slides (Google Slides, 2024). These slides presented the same information found within the AR environment and used 2D images, text, audio, and GIFs. This was designed to represent a more traditional approach to candidates researching about BCT. Figure 3 shows an example of the control condition-multimodal slides.

In addition to the two major resources created for the conditions, training modules were created to ensure that they were properly scaffolded, trained, increase reliability of the instruments and to mitigate any novel effects

Day of the Study

This study was conducted on UCF's Downtown Campus in the Makers' Space. As an ethical consideration, subjects reported in groups not larger than three and by condition. On the day of the study the subjects arrived and were given an ID number and a consent form. Once consented, they completed a pre-survey, pre-stress survey, and pre- test. The subjects were then provided training by condition. Next, the subjects were escorted to the area in which they would interact with either the AR app or Google Slides. After the designated time passed, the subjects were then given a postsurvey, post PSS and posttest. After a brief break, the subjects reported to a designated area one by one where they completed a think-aloud/task analysis with two raters coding. All other participants waited outside. After completion of the study, the participants were offered a 10-dollar gift card. All testing instruments and surveys were designed by Christopher Webb except for the proven psychological stress survey (State New Hampshire Employee Assistance, n.d.).

RESULTS

Table 1. Mann-Whittney U Strong Trend

Question number	Question (sub question topic)	Web (Google Slides) Control Median (SD)	AR App Experimental Median (SD)	U	p	Results
Q11	How familiar are you with the following concepts? US Army Rank Structure	3.00 (0.894)	5.00 (0.447)	21.500	0.056	Strong Trend
Q12	Describe your levels of concern during Basic Combat Training. Homesickness	2.00 (2.049)	5.00 (0.837)	21.000	0.095	Strong Trend
Q13	Do you believe that augmented reality training can prepare you to address any of the following stressors?					
	Anxiety	4.00 (1.817)	5.00 (0.548)	22.000	0.056	Strong Trend
	Stress	4.00 (1.483)	6.00 (0.548)	20.500	0.095	Strong Trend
Perceived Stress (PSS Survey Instrument)		0.00 (0.894)	0.00 (0.548)	20.500	0.095	Strong Trend

Descriptive and inferential non-parametric statistics were used to measure differences pre-and post-intervention between the subjects and between the two groups. For this analysis, we will focus on inferential statistics to evaluate the differences and trends between the conditions. Due to the sample size and the lack of normal distributions when comparing the data, a Mann-Whitney-U Test was used. SPSS was used as the means of analyzing the results (IBM Corp, 2024). Table 1 highlights strong trends observed in the data.

No Statistical Differences

There were several instances in which there were no statistical differences between the groups. For example, when comparing the pre/posttest scores there were no statistical differences. Control (Median = 0.38, SD = 0.117) and the Experimental (Median = 0.37, SD = 0.26) U = 12.000, W = 27.000, p = 1.000. This was also true of the think aloud protocol, Control (Median = 18.00, SD = 7.085) and the Experimental (Median = 14.00, SD = 3.435), U = 8.000, W = 23.000, p = 0.421.

Strong Trends

The results show that there were differences in a variety of Likert-scale survey questions and the perceived stress survey. Subjects in the AR condition had higher rankings of perceived learning as it relates to understanding the US Army Rank Structure. This population also expressed a higher level of concern as it relates to homesickness. The subjects in the AR condition also had more favorable rankings, as it relates to AR's ability to mitigate the subcategories of anxiety and stress. See Table 1 for a breakdown by condition.

Correlations

In addition to the descriptive and inferential statistics, a spearman rho was conducted to compare select categories of interest (test score changes, perceived stress score changes, levels of concern-homesickness, whether AR can prepare for anxiety and stress). There was a positive correlation found within the control condition between perceived stress score changes and levels of concern-homesickness, $r_s(8) = 0.884$, p = 0.047. Additionally, there was a negative correlation between levels of concern-homesickness and test score changes, $r_s(8) = -0.949$, p = 0.014. There were no correlations within the experimental AR condition.

Qualitative Analysis

Table 2. Qualitative Examples of Subjective Evaluation

Qualitative Examples of Subjective Evaluation AR App and Multimedia Slides	
Control Condition (Google Slides)	**Experimental Condition (AR)**
Subjects 1 and 3 spent time on the slides and did not rush (mostly the ones with audio clips). Faster movement noticed through resources/SHARP/EEO slides. Subject 1 spend more time on the facing movement slides. (Both subjects had time to go back to review the slides.	**Subjects 6 and 10** engaged in app and taking the time to listen to the audio. Subject 10 reaching out to grab things in AR. Immersion? Subject 10: Verbalizations Hmmm, huh? Subject 10: commented that the AR app was super effective after the study.
Subjects 4 and 9 took time to review the ACFT slides (listening to the audio). Both subjects moved faster through the military resource's slides.	**Subjects 5 and 13** focused on the material and engaged in the app.
Subject 12 spent considerable time on the audio clips.	**Subject 17** showed signs of immersion and engagement: "What do the green checks mean on the poster [in the app]?" Focused on the material. Signs of awareness of immersion (walking backwards carefully and cognizant of surroundings. Practicing movements (salute and facing movements).

A mixed methods approach qualitative data was gathered using the feedback provided on the survey instruments and the observations from the PI. Overall, there were positive rankings from both groups when asked if they felt prepared based on the varying interventions (Q18) although there seemed to be minor changes to their interest in BCT pre-post intervention (Q16). The subjects also provided feedback on what they were uncertain about after the intervention, which focused on accommodations, move, schedule, tasks, and physical demands.

To evaluate RQ2, immersion and engagement were evaluated using the field notes. Subjects within the AR condition was more engaged and immersed in the environment. Field notes were chosen as the method to evaluate these variables because it reflected the PI's observations in situ of the varying experiences such as verbalizations and gestures. See Table 2 for examples of PI observations.

DISCUSSION

Research Questions

Research Question #1 and 3: A Mann-Whitney U showed that there was no statistical difference. We accepted the null hypothesis. These findings that learning or transfer were not different is not surprising as research suggests that actual learning does not necessarily equate to perceived learning (Harrington, 2020). This implies that just because the subjects had higher rankings or what they believed they learned it does not always translate to the raw scores. In other words, while AR may lead to more affective results, performance (i.e., transfer) may not be affected (Grassini and Laumann, 2020).

Research Question #2: There was a difference in perceived learning (US Army Rank Structure). There was a difference in immersion and engagement between the groups. We rejected the null hypothesis. The subjects within the AR condition expressed a higher ranking of perceived learning, specifically as it relates to the US Army rank structure. If we consider the ranks and grades, they are composed of both text and images which are used to describe them. This may reinforce learning and promoting inter-channel work, or associative processing, as described by Paivio, 1975. (pp. 179-211). More research is needed to further evaluate this finding in comparison with the dual coding theory. Additionally, subjects within the AR condition expressed more signs of immersion and engagement. This finding is consistent with research on the affordances of AR (Dede, 2009).

Stress and Anxiety

There were also several indications that this training had benefits specific to stress and anxiety and would provide the "culture shock" necessary to show the candidates the stressors within BCT (pp. 871). For example, a subject within the AR condition reported that #13 reported "I feel prepared with information related to what situation I would be about to enter. I foresee lower anxiety levels about entering training armed with information I would not previously have." Additionally, subject #9 of the control condition reported "I feel more prepared and less stressed about not being familiar with Army knowledge. These comments imply that both conditions promoted positive ranking for the categories of stress and anxiety. This implies that stress and anxiety preparation is possible within both interventions.

Correlations Discussion

There was one positive correlation (perceived stress and levels of concern -homesickness) and one negative correlation (levels of concern-homesickness and test score changes). One explanation of the positive correlation is that they were less stressed and concerned about homesickness due to the lack of information and realism provided. Additionally, as candidates felt less concerned about homesickness, their scores improved. This may also be due to the lack of realism provided by the Control condition inducing a false sense of preparedness. There were no correlations found within the AR condition. We argue that due to the immersive and embodied experiences within the AR app, subjects were provided the realism necessary to both understand the stressors, which explains why subjects within the AR condition had higher perceived stress levels and higher levels of concerns for homesickness and have higher opinions of the utility of AR to prepare for stress and anxiety. This finding implies that AR through its affordances can provide the realism necessary to prepare candidates for BCT. This could have implications on making sure that the Army enlists the "right" candidate that can deal with the culture and could provide training that would strengthen candidate's resiliency and hardiness prior to training.

Gaps and Limitations

There were several gaps and limitations within this pilot study such as: using a sample of convenience, which as it tuns out, were not interested in BCT. Additionally, there were errors on the testing instruments (i.e., some wording was incorrect). Partial credit on the tests were not given for the questions. If this was changed, scores may have been higher. There was also usability issues notated within the AR app to include: missing audio, avatars, and the lack of ability to practice some of the tasks while holding the tablet. Lastly, there were limitations within the think aloud protocol/task analysis, such as a lack of video and clearness of the rubric. None of these limitations drastically affected this study but should be improved upon during future iterations of this study.

CONCLUSION

Culture adjustment is a complicated subject. What might appear to be a routine adjustment for some may be a significant emotional event for others. The lack of adjustment to the Army's organizational culture offers unique disadvantages and consequences (namely attrition). This initiative highlights the potential of informal learning opportunities to prepare BCT candidates for the military experience, creating better fits and weeding out persons that are not able to cope. This along with the educational opportunities already established can provide tangible and positive results. This can be made possible through informal learning experiences that exploit immersive and embodied experiences while encouraging self-regulation, self-directed learning, motivation, and engagement.

This initiative and the initial results from this pilot study are not limited to the findings shown. By extension, they could be useful to prepare any person for new environments. This makes the work conducted in Operation D.A.R.T. valuable to the broader informal learning community. In other words, the same digital technologies could be used to prepare people to understand the culture in a new job, community or even a friend circle! More research, with a larger sample, is needed to better understand the trends and correlations discussed and lessons learned should be considered for any future iterations of Operation D.A.R.T.

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