



ARL-TR-9275 • AUG 2021



# Why a Focus on Attitudes Is Important to Army Teams

By Shannon Moore

Approved for public release: distribution unlimited.

## **NOTICES**

### **Disclaimers**

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

Destroy this report when it is no longer needed. Do not return it to the originator.



# Why a Focus on Attitudes Is Important to Army Teams

**Shannon Moore**

*Human Research Engineering Directorate,  
DEVCOM Army Research Laboratory*

**REPORT DOCUMENTATION PAGE**

*Form Approved*  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

<b>1. REPORT DATE (DD-MM-YYYY)</b> August 2021		<b>2. REPORT TYPE</b> Technical Report		<b>3. DATES COVERED (From - To)</b> 2011–2021	
<b>4. TITLE AND SUBTITLE</b> Why a Focus on Attitudes Is Important to Army Teams				<b>5a. CONTRACT NUMBER</b>	
				<b>5b. GRANT NUMBER</b>	
				<b>5c. PROGRAM ELEMENT NUMBER</b>	
<b>6. AUTHOR(S)</b> Shannon Moore				<b>5d. PROJECT NUMBER</b>	
				<b>5e. TASK NUMBER</b>	
				<b>5f. WORK UNIT NUMBER</b>	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> DEVCOM Army Research Laboratory ATTN: FCDD-RLH-FC Aberdeen Proving Ground, MD 21005				<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>  ARL-TR-9275	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>				<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>	
				<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>	
<b>12. DISTRIBUTION/AVAILABILITY STATEMENT</b> Approved for public release: distribution unlimited.					
<b>13. SUPPLEMENTARY NOTES</b> ORCID ID: Shannon Moore, 0000-0002-4986-1659					
<b>14. ABSTRACT</b> Accurate knowledge of others has been linked not only to relationship benefits, but also better physical and mental health. Here, we focus on the relevance of a certain type of partner knowledge, knowledge of others' attitudes, to Army teams and tasks. Applying the study of attitude familiarity to workplace teams, recent work has found that manipulating familiarity in the laboratory can improve team performance on Army-relevant tasks. When teammates learn their partners' task-relevant attitudes, they exhibit more accurate and faster performance.					
<b>15. SUBJECT TERMS</b> attitudes, familiarity, attitude familiarity, AF, teams, partner knowledge, collaboration					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>  UU	<b>18. NUMBER OF PAGES</b>  31	<b>19a. NAME OF RESPONSIBLE PERSON</b> Shannon Moore
<b>a. REPORT</b> Unclassified	<b>b. ABSTRACT</b> Unclassified	<b>c. THIS PAGE</b> Unclassified			<b>19b. TELEPHONE NUMBER (include area code)</b> (410) 278-2696

Standard Form 298 (Rev. 8/98)  
Prescribed by ANSI Std. Z39.18

## Contents

---

<b>List of Figures</b>	<b>v</b>
<b>1. Introduction</b>	<b>1</b>
1.1 Why Attitudes?	1
1.2 Prior Relevant Work on Attitude Familiarity in the Literature	2
1.3 The Application of Attitude Familiarity to Teams in the Workplace	3
<b>2. Study 1: Information Sharing Task</b>	<b>4</b>
2.1 Application	4
2.2 Measurement	5
2.3 Study Design	6
2.4 Results	6
2.4.1 Calculating Familiarity	6
2.4.2 Outcomes	7
2.4.3 Discussion	8
<b>3. Study 2: Simulated Shooting Task</b>	<b>9</b>
3.1 Application	9
3.2 Measurement	11
3.3 Study Design	11
3.4 Results	11
3.4.1 Calculating Familiarity	11
3.4.2 Performance Outcomes	12
3.4.3 Self-Report Outcomes	12
3.4.4 Discussion	13
<b>4. Conclusion and Future Directions</b>	<b>13</b>
<b>5. References</b>	<b>16</b>
<b>Appendix A. Task-Relevant Attitudes (Study 1)</b>	<b>19</b>

<b>Appendix B. Task-Relevant Attitudes (Study 2)</b>	<b>21</b>
<b>List of Symbols, Abbreviations, and Acronyms</b>	<b>23</b>
<b>Distribution List</b>	<b>24</b>

## List of Figures

---

Fig. 1	While both teammates had incident information (e.g., bombings in the city), they also had access to unique variables .....	5
Fig. 2	Bird's eye view of the seven-lane environment.....	10
Fig. 3	First-person view. The participant is in the intersection and in the process of transporting themselves forward. Civilians (green), HVTs (yellow), and enemy individuals (red) and tanks are progressing toward them. ....	10

## **1. Introduction**

---

Accurate knowledge of partners or teammates is important, being as it is linked to relationship benefits as well as better mental and physical health outcomes. In general, greater knowledge of significant others is associated with greater relationship satisfaction (Gottman 1994), and people report greater commitment even when partners verify their negative qualities (Swann et al. 1992, 1994). However, as we focus on improving team interactions and performance in the Army, we have chosen to focus on utilizing a specific type of familiarity from the partner knowledge literature—attitude familiarity (AF). This refers to knowledge of a partner’s or teammate’s relevant attitudes.

In this report, we review why knowledge of others’ attitudes should be particularly influential to the success of Army teams, prior relevant work, and our initial findings manipulating AF in the workplace.

### **1.1 Why Attitudes?**

---

When we refer to attitudes, we specifically mean evaluations of and feelings toward objects, persons, situations, issues, events, and behaviors that are stored in memory (e.g., Petty and Cacioppo [1981]). Fabrigar et al. (2005, p. 82) state, “The contemporary view holds that an attitude is an entity distinguishable from the classes of affect, behavior, and cognition. An attitude, therefore, does not consist of these elements, but is instead a general evaluative summary of the information derived from these bases (Cacioppo et al., 1989; Crites, Fabrigar, & Petty, 1994; Zanna & Rempel, 1988).” There are numerous reasons to expect that knowledge of a person’s attitudes would be a particularly useful type of knowledge to acquire. This is because a person’s attitudes affect and influence them in a variety of ways:

- a) Attitudes are functional (Katz 1960; Shavitt 1990). Specifically, they guide information processing (Lord et al. 1979) and influence appraisals of situations and response alternatives (Sanbonmatsu and Fazio 1990).
- b) Attitudes affect behavior (Ajzen and Fishbein 1977; Fazio 1990). Specifically, observing an attitude object can activate the attitude one holds, and this can affect approach versus avoidant behaviors. “Approach behaviors are prompted by a definition of the event that consists primarily of positive perceptions of the attitude object in the immediate situation. Likewise, avoidance behaviors follow from a negative definition of the event” (Fazio 1990, p. 85).

- c) Strong attitudes are even more influential; the availability of strong attitudes facilitates decision-making and reduces the stress associated with making difficult choices (Blascovich et al. 1993; Fazio and Powell 1997).
- d) It has been proposed that when people are unable to deliberate on a decision or behavioral choice, they will spontaneously act in line with their attitudes (Fazio 1990). Thus, a person's attitudes should be particularly relevant to know in situations of great time pressure, making this especially relevant to the Army.

For all these reasons, scholars proposed that AF should enable “individuals to better anticipate, influence, and respond to others’ behavior (i.e., it is functional). The overall effect of attitude familiarity would be to foster relationship processes in daily life” (Sanbonmatsu et al. 2011, p. 132).

## **1.2 Prior Relevant Work on Attitude Familiarity in the Literature**

---

We now review the prior literature examining AF in couples, which has found greater levels of AF to be associated with better interactions, mental health, and physical health. While our application of AF to the workplace will have a much narrower content focus than past work, the results of this earlier research are still vital to review as it helps establish the potential of AF to improve interactions. Specifically, initial works examined whether greater knowledge of a romantic partner's attitudes toward a variety of people (e.g., celebrities, politicians), places (e.g., museums, chain stores), and things (e.g., money, guns) were associated with better relationship and health outcomes. These works focus on a broad array of attitudinal objects; this makes sense as romantic couples are likely to experience a variety of situations, choices, and events together that would make most attitudinal objects relevant to their relationship at some time. Overall, these works establish a link between general AF and reports of better overall relationship functioning, specific interpersonal processes, and even effects on physical and mental health, all of which help point to AF as a construct worth exploring in the Army.

Results from Sanbonmatsu et al. (2011) indicate AF is associated with better overall relationship functioning. Partners who are more familiar with each other's attitudes perceived one another as more responsive, reported more positive interactions, and had higher state self-esteem compared to less familiar pairs. In a follow-up study, Sanbonmatsu et al. (2012) examined AF in relation to *specific* interpersonal processes. Partners who knew each other's attitudes reported they were less likely to fight, less likely to upset one another, and more helpful. These relationship partners reported less conflict, greater perceived importance, and higher levels of

affiliation. Furthermore, familiarity was predictive of relationship functioning independently of marital status, relationship length, and gender.

These early studies found that AF was associated with less conflict and greater support, both of which are predictors of physical health, perhaps because their interactions were less stressful. Couples less familiar with each other's attitudes were also found to have higher daily ambulatory blood pressure readings (Sanbonmatsu et al. 2011), a strong predictor of future cardiovascular risk (Pickering et al. 2006). Conflict is known to negatively affect cardiovascular reactivity (e.g., Smith et al. [2009]), and it has been suggested this sustained elevated cardiovascular response could contribute to future cardiovascular disease (Chida and Steptoe 2010). A comprehensive meta-analysis found that across 148 studies, social support predicted survival, and its effect was comparable to that of factors like smoking and exercise (Holt-Lunstad et al. 2010).

Another study established clearer links between AF and mental health, finding that knowledge of partner's attitudes was associated with greater satisfaction with life, and this association was mediated by marital satisfaction (Moore et al. 2017). Couples who knew each other better were also more satisfied in their marriage, which was associated with higher satisfaction with life. This finding makes sense as social support, which is reportedly higher in familiar couples (Sanbonmatsu et al. 2012), and is also linked to lower rates of depression (Lakey and Cronin 2008), lower levels of psychological distress (Cohen and Wills 1985; Barrera 1986), and lower levels of negative affect (Finch et al. 1999). It has been suggested by the buffering hypothesis that when people receive social support, it affects their appraisals of stress and weakens the relationship between stress and poor health (Cohen and Wills 1985). This provides further support that AF may positively influence both mental and physical health via its impact on relationship functioning.

### **1.3 The Application of Attitude Familiarity to Teams in the Workplace**

---

Prior work was important in establishing that higher levels of AF are associated with interpersonal processes such as conflict and support, while also finding links to improved mental health and decreased physical health risk. However, to apply this concept to the Army, several adjustments needed to be made:

- 1) *Application.* This concept needed to be applied to teams in the workplace to ensure that these findings would be generalizable to the Army. We did this by conducting our next two studies in the workplace, where teams of two worked together to complete Army-relevant tasks.

- 2) *Measurement.* Instead of examining familiarity based on a wide array of attitudes (e.g., chain stores, money), we focused on attitudes directly relevant to the task that teams would complete together. This is because in a professional setting, teams can be focused on specific tasks. Thus, it is possible to hone in on attitudes relevant to those team tasks, and it is inherently more efficient to focus on those attitudes alone versus measuring other, unrelated, and likely not useful, attitudes.
- 3) *Study Design.* We needed to conduct experimental studies of AF because no one had established whether AF causes better relationship functioning. Thus, we also needed to create a way to manipulate levels of AF in the laboratory.

## **2. Study 1: Information Sharing Task**

---

### **2.1 Application**

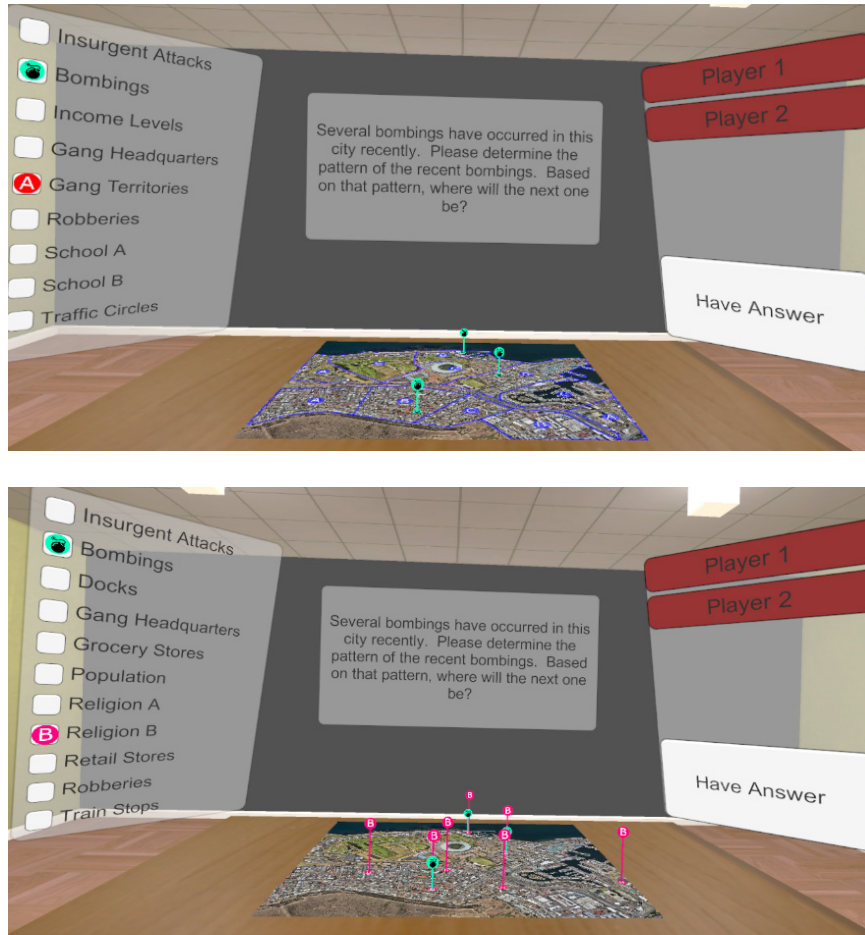
---

We first focused on developing a team-relevant task and recruiting from a workplace environment. Participants were civilian government employees or contractors who were recruited from the Aberdeen Proving Ground, Maryland. Participants volunteering to participate in this study were placed into teams of two based on their provided availability (Moore and Geuss 2020).

Because we were applying the study of AF to Army teams, we also needed an Army-relevant task for these teams to complete together to assess how Familiar versus Unfamiliar teams worked together. We created a cooperative reasoning task intended to serve as a proxy for emergency operations and military mission command. Pairs viewed four maps of cities, two of which were displayed while they worked in virtual reality (VR) and two of which were displayed on computer monitors. Thus, we were also able to determine if the medium used influenced the relevance of AF. Participants were asked six questions per map. While participants had access to the same city map and the same data on incidents in that area (e.g., locations of robberies, attacks, bombings, and assumed gang headquarters), they each had access to unique information about that city that their partner did not (Fig. 1). Of the six questions posed for each map, there were three *types* of questions.

- 1) Two questions per map asked the participants to identify information presented on one or the other partner's map.
- 2) Two questions per map asked the participants to cross reference information presented on each partner's map.

- 3) Two questions asked participants to cross reference information presented on each partner's map and then, as a pair, make a prediction beyond the information presented.



**Fig. 1** While both teammates had incident information (e.g., bombings in the city), they also had access to unique variables

When in VR, in addition to being able to talk to one another, partners could also view one another's controller, enabling them to point to or highlight the areas of the map to which they were referring. Similarly, when working on the computer monitors, partners could talk to one another and see the movements of each other's computer mouse, which could be used as a pointer in this condition. While they could also see one another in this situation, partners were placed such that they could not view each other's computer screen.

## 2.2 Measurement

Because we modified the task to make it more Army-relevant, we had to consider which attitude objects would be relevant to this task—that is, what information

would be helpful for teammates to know about one another? To address this, we focused our attitude objects on the aspects of the task, such as “computers, VR, geography”, and so on. We also wanted to include attitudes relevant to the skills required to do well (e.g., reading maps, word problems). Finally, we incorporated attitude objects related to the situation more generally by adding items such as “participating in studies, working with a partner, working with a team”. Our final list comprised 27 attitudinal objects (see Appendix A). These adjustments enabled us to move from assessing familiarity with a variety of attitudes and instead emphasizing familiarity with task-relevant attitudes for teams. Further, narrowing the focus to task-relevant attitude objects aligns our work with research showing that to predict future behavior, the specificity of the attitude measured should be congruent with the specificity of the behavior of interest (e.g., Weigel et al. [1974]).

## **2.3 Study Design**

---

By recruiting teams from the workplace and designing a task and a list of attitudes to measure and assess specific to that task, we created a situation where we would be able to manipulate AF for the first time. Teams were randomly assigned to the Familiar or Unfamiliar condition. Those in the Familiar condition participated in what was framed as an “icebreaker” prior to the team task. They were asked to discuss their task-relevant attitudes, using the list in Appendix A, for a period of 10 min. They were told the list contained activities or objects relevant to the joint decision-making problems they would be working on together and they could skip any items they wished. They could be as specific or as general as they wanted when discussing whether they liked or disliked an item, but were asked to limit their discussion to items on the list. We also told Familiar teams they would later be asked to recall their partner’s attitudes as a way to ensure they were focused on the task. After the 10-min discussion, participants wrote down everything they remembered about their partner’s attitudes for 5 min. In contrast, teams in the Unfamiliar condition immediately began their joint task without any prior discussion.

## **2.4 Results**

---

### **2.4.1 Calculating Familiarity**

Another issue to address from past work is how familiarity is calculated. In the past, AF was calculated by conducting an overall correlation between a person’s self-reported attitudes and their partner’s perception of that person’s attitudes. Own attitudes and perceptions of others’ attitudes were reported on a scale, where each attitude object was rated from  $-3$  (very negative attitude) to  $+3$  (very positive

attitude). However, in recent years, it has been suggested these overall indices of familiarity could be linked to positive outcomes (e.g., relationship quality) simply because most people report having normal, desirable traits (e.g., Wood and Furr [2015]). It is now recommended to separate familiarity into two components: distinctive and normative accuracy. Distinctive accuracy assesses whether an individual knows how their partner differs from the average person—do they know the ways in which their partner is unique? This is calculated by subtracting a normative profile (e.g., the average answer per attitude/item across all respondents) from each person’s self-reported attitudes as well as perceptions of their partner’s attitudes. The correlation between the revised self and informant reports is a measure of distinctive accuracy, indicating how well a person knows the ways in which their partner’s attitudes are distinct from the average person’s attitudes. This is the type of accuracy we sought to manipulate in our work examining AF in Army-relevant situations. Normative accuracy, on the other hand, assesses whether a participant estimates their partner as possessing the typical or average person’s attitudes. To calculate this, informant reports are correlated with the normative profile. In the absence of specific knowledge of a person, it is likely people would rely on their knowledge of the average person to estimate their attitudes. Thus, by not using the raw, overall indices, we can more narrowly focus on distinctive accuracy (knowledge of how one’s teammate is unique) while better avoiding potential confounds by subtracting the average/positive components from each item.

In this study (Moore and Geuss 2020), we conducted a manipulation check to ensure that our manipulation actually created distinctive familiarity. The Familiar condition ( $m = 0.42, sd = 0.18$ ) was significantly more accurate in their assessments of their partners’ task-relevant attitudes compared to the Unfamiliar condition ( $m = 0.18, sd = 0.21, t(18) = -2.784, p = 0.012$ ). Thus, our first attempt to manipulate distinctive accuracy for teammates’ task-relevant attitudes was successful.

#### **2.4.2 Outcomes**

The outcomes examined in this study (Moore and Geuss 2020) were participants’ accuracy across the three types of questions and their response times. We also had participants self-report communication quality, under the assumption that Familiar teams might perform better due to AF improving communication between teammates.

For Type 1 questions (identifying information), there were no significant differences. For Type 2 questions (cross referencing information, determine a pattern), we found that when in VR, Unfamiliar teams were less accurate than

Familiar teams; however, we found no performance differences between conditions when using computer monitors. This suggests AF may be more helpful for teams in new, potentially more challenging environments, such as VR. For Type 3 questions (cross reference information and predict a future event), teams with less VR experience were more accurate at predicting future events when in the Familiar condition. In terms of response time, Familiar pairs were slightly slower to answer questions. There were no differences in self-reported communication quality.

### **2.4.3 Discussion**

This study (Moore and Guess 2020) was the first successful manipulation of distinctive AF. This is particularly encouraging as we were able to take a concept previously examined correlationally, adapt it to teams in the workplace, and create a successful manipulation of AF. In hindsight, it makes sense that we saw no advantage for Familiar teams when addressing Type 1 questions; such questions involved one partner reading information from their map and thus did not require any collaboration or discussion. Therefore, it is unlikely that any benefits from AF would reveal themselves for this aspect of the task (e.g., less conflict, more support or help).

However, for the more complex, team-oriented questions, we found that Familiar teams were more accurate at cross referencing information with one another in order to determine patterns to events, but this was only the case for teams in VR. While it is interesting that this finding did not extend to the same questions answered when using computer monitors, it is still encouraging because VR is a relatively new medium for teamwork. The way we implemented the task in VR also meant that teammates could not see one another physically. Thus, they lost access to important information such as facial expressions, gestures, posture, and so on. Arguably, working in VR, a new environment, would be more difficult than the more typical situation of sitting near a partner while working on computer monitors. This might suggest AF is most useful at improving interactions in new, challenging environments or such situations when visual cues from one's teammates are lacking.

We also found that Familiar teams were more accurate at cross referencing information and then predicting a future event—though this was only true for teams with less VR experience. This again points to the potential of AF to aid or help those teams that find themselves in a disadvantaged situation—be it a lack of cues from one's partner or a lack of experience in an environment overall.

This study (Moore and Guess 2020) also found that Familiar pairs on average were slower at responding, but it did not appear to be due to any difference in

communication quality. Because Familiar pairs were more accurate, perhaps part of the reason for this greater accuracy was that they spent more time deliberating on an answer. While these findings were promising, several questions remain; to that end, we initiated a second study examining AF and its relevance to a separate Army-relevant task.

### **3. Study 2: Simulated Shooting Task**

---

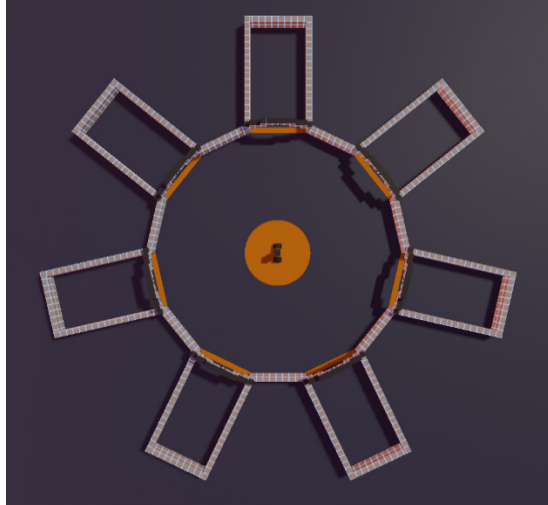
#### **3.1 Application**

---

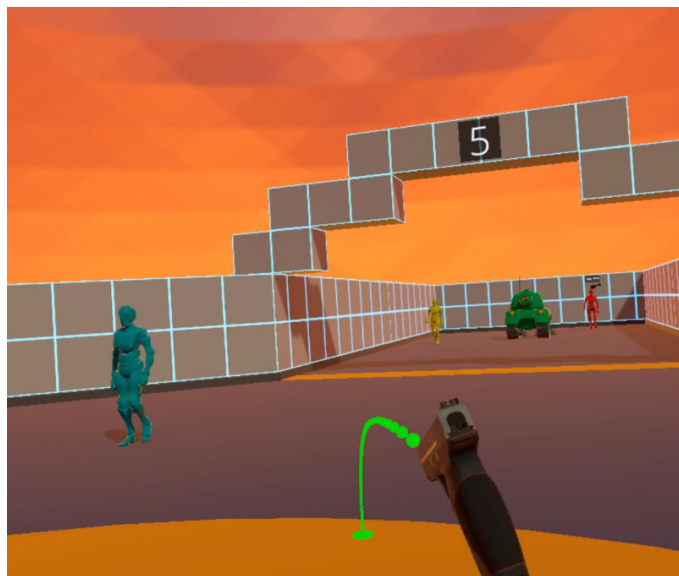
We again recruited participants from a workplace environment (e.g., civilian employees or contractors from the Aberdeen Proving Ground) to ensure greater relevance to the Army. Based on their availability, participants were scheduled as two member teams (Moore et al. under review).

It was important to verify AF was useful for teams working on other types of tasks. For a more clearly Army-relevant task, we designed a simulated shooting activity in VR. We also addressed a possible confound from the prior study: in Moore and Geuss (2020), teammates were placed within defined roles given the nature of the task. Specifically, each member only had access to a subset of information needed to answer questions, which limited their ability to explicitly negotiate distinct team roles. Thus, for this study, we also manipulated whether participants defined and assigned themselves roles prior to each phase of the task.

We designed a cooperative first-person shooter task in VR for teams to complete. Participants were standing, viewing themselves within an intersection where multiple lanes met (either three- or seven-lane intersections; see Fig. 2). They were able to view their partner's HTC Vive headset-mounted display and gun (i.e., their Vive controller) in the environment, but did not see their partner's features or an avatar. Enemy tanks and individuals (i.e., targets) emerged from each lane along with civilians, and all proceeded toward the intersection. The HTC Vive controller was used to shoot targets by pulling the trigger, throw grenades at tanks by using the side grips, and capture highly valued targets (HVTs). Participants could also use the controller to transport themselves to difference locations in the environment without the need to physically walk around the laboratory space (Fig. 3).



**Fig. 2** Bird's eye view of the seven-lane environment



**Fig. 3** First-person view. The participant is in the intersection and in the process of transporting themselves forward. Civilians (green), HVTs (yellow), and enemy individuals (red) and tanks are progressing toward them.

After a brief tutorial of the environment, teams completed multiple 2-min trials, first within a three-lane intersection and then within a seven-lane intersection. The goal was to not allow enemy targets to reach the center intersection, avoid harming civilians, and capture the HVTs as soon as possible. While both guns and grenades could be used to eliminate individual targets, tanks could only be eliminated using the grenades. To investigate the relevance of defined roles on the effectiveness of AF in teams, pairs were randomly assigned to spend 30 s prior to each trial either 1) jointly discussing the role each would assume (e.g., “I’ll eliminate targets, you

eliminate tanks” or “I’ll handle lanes 1–4, while you take lanes 5–7”) or 2) studying the environment silently.

## **3.2 Measurement**

---

To truly manipulate task-relevant attitudes, we first had to create a list of activities or preferences relevant to this collaborative shooting task. It is important to not reuse the older scales because our focus is on task-specific AF—thus the scale needed to be redesigned for this study. We selected items directly applicable to the task, such as VR, working with a partner, timed tasks, and target shooting. Other attitudes that may have had an indirect effect on performance were also included, such as the time of day participants preferred to work, and overall preferences toward items like guns, strategizing, or high-pressure situations. The complete list of the 25 attitudes assessed is provided in Appendix B.

## **3.3 Study Design**

---

We built upon our prior work (Moore and Geuss 2020) by examining AF experimentally in the lab in an attempt to replicate the finding that AF can lead to improved team performance. Teams were randomly assigned to the Familiar or Unfamiliar condition. Those in the Familiar condition completed an icebreaker prior to the team task, where they discussed their task-relevant attitudes with one another for 10 min. They were reassured they could skip any items they did not want to discuss and they could be as specific or general as they wished when discussing an attitude. After the discussion, they wrote down everything they could recall about their partners’ attitudes for 5 min. In contrast, the Unfamiliar condition engaged in silent self-reflection by describing their own attitudes for 5 min.

## **3.4 Results**

---

### **3.4.1 Calculating Familiarity**

The calculation of AF followed the process described in Moore and Geuss (2020) earlier. Following recent recommendations, we calculated teams’ distinctive accuracy regarding task-relevant attitudes using participants’ self-reported attitudes and perceptions of their partners’ attitudes. A manipulation check found that teams who shared their task-relevant attitudes were more accurate at predicting each other’s self-reported attitudes ( $M = 0.422$ ,  $SD = .141$ ) than those who did not engage in the exercise ( $M = 0.092$ ,  $SD = 0.171$ ,  $t(28.97) = 5.843$ ,  $p < 0.001$ ) (Moore et al. under review). We thus replicated our ability to increase task-relevant AF in workplace teams.

### 3.4.2 Performance Outcomes

We assessed multiple performance outcomes to determine if AF improved team performance. For completion time, we found that Familiar teams were slower overall in three-lane environments ( $b = 0.911$ ,  $se = 0.392$ ,  $p = 0.028$ ). However, manipulating roles had no effect nor did the interaction between manipulations. For the seven-lane sessions, there was no effect of familiarity or roles, but the interaction was significant. Familiar teams who also discussed their roles in the seven-lane sessions completed sessions approximately 4 s faster on average ( $b = -3.732$ ,  $se = 1.488$ ,  $p = 0.0182$ ).

We also assessed sensitivity—this refers to the tradeoff between increasing the probability of eliminating targets but also decreasing the risk of harming civilians (Wright et al. 2009). Neither familiarity nor role manipulation significantly influenced sensitivity in the three-lane environments. However, there was a three-way interaction among familiarity, roles, and stimulus type. Specifically, Familiar teams that defined their roles were more sensitive to targets than teams in other conditions ( $b = 0.578$ ,  $se = 0.250$ ,  $z = 2.312$ ,  $p = 0.021$ ,  $OR = 1.782$ ). For the seven-lane sessions, sensitivity results were similar. Only a three-way interaction occurred, where Familiar teams that discussed their roles were more sensitive ( $b = 0.578$ ,  $se = 0.250$ ,  $z = 2.312$ ,  $p = 0.021$ ,  $OR = 1.782$ ).

No significant differences were found when examining the number of HVTs captured or the speed with which they were captured in the three- or seven-lane environments. There was no real evidence that our manipulated variables affected HVT captures.

We next examined the likelihood of destroying tanks. For both three and seven lanes, there was no evidence of the manipulations having an effect. We also examined whether there was an effect on how quickly teams reacted to the tanks. Here we found that while Familiar teams and teams with defined roles had no significant main effects in three lanes, Familiar teams who discussed their roles destroyed tanks approximately 6.226 s faster in three lanes ( $b = -6.226$ ,  $se = 2.164$ ,  $t(22.894) = -2.878$ ,  $p = 0.009$ ). No significant findings were evident regarding tank reaction time in seven-lane environments.

### 3.4.3 Self-Report Outcomes

We were also interested in attempting to establish *how* AF may function to improve team performance. Is it by positively influencing interpersonal variables? However, we found no significant effects of the Familiar condition on self-reported communication quality, task-related or interpersonal stress, teammate satisfaction, or trust. However, there was a marginally significant trend for Familiar teams to

report greater social cohesion ( $b = 0.625$ ,  $se = 0.307$ ,  $t(28) = 2.035$ ,  $p = 0.051$ , 95% CI [0.045, 1.205]).

### 3.4.4 Discussion

In Moore et al. (under review), we aimed to examine whether teammates' knowledge of one another's task-relevant attitudes improved performance or interactions on a collaborative shooting task in VR. We also examined the boundaries of these effects by manipulating whether teams did or did not define their roles. Overall, results suggested that Familiar teams did tend to show improved performance in terms of both speed and accuracy. They completed tasks (overall sessions, destroying tanks) more quickly and exhibited greater sensitivity. However, this was limited to when they also had clearly defined roles. Interpersonally, Familiar teams reported slightly greater feelings of social cohesion, but the majority of self-reported relationship outcomes were nonsignificant.

Overall, this study provided further evidence that AF can be successfully manipulated in workplace teams. This is encouraging as to be useful to the Army, we need to ensure there is a clear, effective way to implement familiarity. This work also highlights the fact that AF may need to be implemented in teams with clearly defined roles in order to fully optimize its benefits. This is also promising in terms of its relevance to Army situations as Soldiers often have clearly defined duties and operating procedures. Thus, we appear to have honed in on a concept that can be instilled in Army teams effectively and would be successful in an Army environment. This study did raise further questions though, especially regarding why AF leads to improved team performance. Because we were unable to establish a potential interpersonal mediator, further research is needed.

## 4. Conclusion and Future Directions

---

---

Past work (Sanbonmatsu et al., 2011) proposed AF should enable one to better predict others' behavior and make better interpersonal decisions. Yet these ideas have not yet been directly tested. This could be done by creating an experimental task that requires teammates to predict one another's next steps. Or, they could be asked to make a decision for their teammates and then the teammates could rate their approval or disapproval of those decisions. We have attempted to tie AF to interpersonal variables like self-reported communication quality (Moore and Guess 2020; Moore et al. under review), but this has largely been unsuccessful. However, it is vital that future works continue to tease apart *how* familiarity functions to improve teamwork.

It is also important to explore how the effects of AF function or vary over time. This will enable us to better ensure the implementation of our intervention is maximally effective for Army team performance dynamically over time. By doing so, our work will contribute to a coherent *causal* model of the social-psychological mechanisms through which AF contributes to team performance. How can we accelerate the acquisition of familiarity? How can we increase its predictive power or increase the ease at which it is assessed or learned? Researchers need to build upon previous findings regarding the mechanisms through which familiarity does or does not function to improve teamwork. They need to explore initial ways in which we could use such mechanisms to accelerate either the acquisition of knowledge about others or the learning of this relevant information. This could be done by implementing a longitudinal study to investigate the effects of increased familiarity over time in teams.

If successful, these findings will enable us to use AF interventions in future Army teams, allowing for smooth transitions as teams are reconfigured to meet the changing demands of the battlefield. Autonomy is a driving force behind a lot of the Army's recent technological innovations. Human-human familiarity scores (e.g., my knowledge of my teammate's attitudes) could be used by autonomy to assign tasks efficiently. If Jon and Mary have low familiarity with one another regarding their work on Task A, the autonomy could use this information to instead assign them to work on Task B. Or if Jon and Tom have high familiarity regarding Task A, the autonomy could assign Jon a different teammate in order to optimize performance. Another option would be that Jon and Mary's low familiarity on Task A could signal to the autonomy that its help and assistance will be more heavily required during the time they work on Task A.

We saw slightly greater cohesion in Familiar teams. Future work may find other relevant interpersonal variables and we know from past work that familiarity in general is linked to positive relationship outcomes. Creating a context where human teammates learn their autonomous teammates' attitudes could potentially be used to increase feelings of trust in human-autonomy teams. To improve human interactions with autonomy, we might utilize the familiarity intervention, not necessarily to improve performance directly in this instance, but to build on the positive feelings and interactions associated with greater knowledge of others. This could be an initial investment that would pay off in the long run.

Another way in which AF could be implemented in Army teams is by making human-human teams aware of their low familiarity "weaknesses". Building on the example from above, Jon and Mary are relatively unfamiliar with each other's attitudes regarding Task A. As Jon and Mary as a team move from working on Task Z to Task A, autonomy could ping them with a reminder that they have a low

“score” on this task. This reminder could increase their awareness of a potential troublesome task for their team. This heightened awareness could ensure they are on alert, preparing to apply greater effort toward this weak spot. While there are several questions that need to be answered in order to implement the AF intervention effectively, there are a multitude of ways in which creating and increasing task-relevant AF in the Army could improve team performance and interactions.

## 5. References

---

- Ajzen I, Fishbein M. Attitude-behavior relations: a theoretical analysis and review of empirical research. *Psych Rev.* 1977;84:888–918.
- Barrera M. Distinctions between social support concepts, measures, and models. *American J Comm Psych.* 1986;14:413–445.
- Blascovich J, Ernst JM, Tomaka J, Kelsey RM, Salomon KL, Fazio RH. Attitude accessibility as a moderator of autonomic reactivity during decision making. *J Pers Soc Psych.* 1993;64:165–176.
- Cacioppo JT, Petty RE, Green TR. From the tripartite model to the homeostasis model of attitudes. In: Pratkanis AR, Breckler SJ, Greenwald AG, editors. *Attitude structure and function.* Psychology Press; 1989. p. 275–310.
- Chida Y, Steptoe A. Greater cardiovascular responses to laboratory mental stress are associated with poor subsequent cardiovascular risk status: a meta-analysis of prospective evidence. *Hypertension.* 2010;55(4):1026–1032.
- Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. *Psych Bull.* 1985;98(2),310.
- Crites Jr SL, Fabrigar LR, Petty RE. Measuring the affective and cognitive properties of attitudes: conceptual and methodological issues. *Pers Soc Psych Bull.* 1994;20:619–634.
- Fabrigar LR, MacDonald TK, Wegener DT. The structure of attitudes. In: Albarracín D, Johnson BT, Zanna MP, editors. *The handbook of attitudes.* Erlbaum; 2005. p. 79–125.
- Fazio RH. Multiple processes by which attitudes guide behavior: the MODE model as an integrative framework. In: Zanna MP, editor. *Advances in experimental social psychology.* Academic Press; 1990. p.75–109.
- Fazio RH, Powell MC. On the value of knowing one’s likes and dislikes: attitude accessibility, stress, and health in college. *Psych Sci.* 1997;8:430–436.
- Finch JF, Okun MA, Pool GJ, Ruehlman LS. A comparison of the influence of conflictual and supportive social interactions on psychological distress. *J Pers.* 1999;67:581–621.
- Gottman JM. *What predicts divorce?* Lawrence Erlbaum Associates; 1994.
- Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. *PLoS Med.* 2010;7:e1000316.

- Katz D. The functional approach to the study of attitudes. *Pub Op Quart.* 1960;24:163–204.
- Lakey B, Cronin A. Low social support and major depression: research, theory, and methodological issues. In: Dobson K, Dozois D, editors. *Risk factors for depression.* Academic Press; 2008. p. 385–408.
- Lord CG, Ross L, Lepper MR. Biased assimilation and attitude polarization: the effects of prior theories on subsequently considered evidence. *J Pers Soc Psych.* 1979;37:2098–2109.
- Moore SM, Geuss MN. Familiarity with teammate’s attitudes improves team performance in virtual reality. *PLoS ONE.* 2020;15(10):e0241011. <https://doi.org/10.1371/journal.pone.0241011>.
- Moore SM, Geuss MN, Forster D. Attitude familiarity as a measure of team performance. *PLoS ONE.* Under review.
- Moore SM, Uchino BN, Baucom BR, Behrends AA, Sanbonmatsu DM. Attitude similarity and familiarity and their links to mental health: an examination of potential interpersonal mediators. *J Soc Psych.* 2017;157(1):77–85.
- Petty RE, Cacioppo JT. *Attitudes and persuasion: classic and contemporary approaches.* William C Brown Company Publishers; 1981.
- Pickering TG, Shimbo D, Haas D. Ambulatory blood-pressure monitoring. *New England J Med.* 2006;354:2368–2374.
- Sanbonmatsu DM, Fazio RH. The role of attitudes in memory-based decision making. *J Pers Soc Psych.* 1990;59:614–622.
- Sanbonmatsu DM, Uchino BN, Birmingham W. On the importance of knowing your partner’s views: attitude familiarity is associated with better interpersonal functioning and lower ambulatory blood pressure in daily life. *Annals Behav Med.* 2011;41:131–137.
- Sanbonmatsu DM, Uchino BN, Wong KK, Seo JY. Getting along better: the role of attitude familiarity in relationship functioning. *Soc Cog.* 2012;30:350–361.
- Shavitt S. The role of attitude objects in attitude formation. *J Exp Soc Psych.* 1990;26:124–148.
- Smith TW, Uchino BN, Berg CA, Florsheim P, Pearce G, Hawkins M, Olsen-Cerny C. Conflict and collaboration in middle-aged and older couples: II. Cardiovascular reactivity during marital interaction. *Psych Aging.* 2009;24(2):274.

- Swann WB, De La Ronde C, Hixon JG. Authenticity and positivity strivings in marriage and courtship. *J Pers Soc Psych.* 1994;66(5):857–869.
- Swann WB, Hixon JG, De La Ronde C. Embracing the bitter “truth”: negative self-concepts and marital commitment. *Psych Sci.* 1992;3:118–121.
- Weigel RH, Vernon DTA, Tognacci LN. Specificity of the attitude as a determinant of attitude-behavior congruence. *J Pers Soc Psych.* 1974;30(6):724–728. <https://doi.org/10.1037/h0037540>.
- Wood D, Furr MR. The correlates of similarity estimates are often misleadingly positive: the nature and scope of the problem, and some solutions. *Pers Soc Psych Rev.* 2015;20(2):79–99.
- Wright DB, Horry R, Skagerberg EM. Functions for traditional and multilevel approaches to signal detection theory. *Behav Res Meth.* 2009;41(2):257–267.
- Zanna MP, Rempel JK. Attitudes: a new look at an old concept. In: U Bar Tal D, Kruglanski AW, editors. *The social psychology of attitudes*. Cambridge University Press; 1988.

## **Appendix A. Task-Relevant Attitudes (Study 1)**

---

---

The following is the list of 27 attitudinal objects for Study 1:

- 1) computers
- 2) virtual reality
- 3) geography
- 4) reading maps
- 5) independent work
- 6) collaborative work
- 7) meetings over the phone
- 8) in-person meetings
- 9) working early in the day
- 10) working in the afternoon
- 11) working in the evening
- 12) navigating
- 13) deadlines
- 14) current events
- 15) offensive language (*i.e., swearing*)
- 16) visual displays of information
- 17) icebreakers
- 18) participating in studies
- 19) word problems
- 20) puzzles
- 21) video games
- 22) history
- 23) working with a partner
- 24) working with a team
- 25) politics
- 26) information provided in written form
- 27) memory games

## **Appendix B. Task-Relevant Attitudes (Study 2)**

---

---

The following is the list of 25 attitudinal objects for Study 2:

- 1) virtual reality
- 2) working with a partner
- 3) working independently
- 4) working early in the day
- 5) working in the afternoon
- 6) working in the evening
- 7) informality in the workplace
- 8) formality in the workplace
- 9) icebreakers
- 10) participating in research studies
- 11) video games
- 12) guns
- 13) strategizing
- 14) multitasking
- 15) athletics
- 16) target shooting
- 17) risk-taking (in regards to work)
- 18) concise discussions
- 19) specific/lengthy discussions
- 20) rapid decision-making
- 21) timed tasks
- 22) adhering to set plans
- 23) being flexible with plans
- 24) high pressure situations
- 25) cooperative games

## List of Symbols, Abbreviations, and Acronyms

---

AF	attitude familiarity
HVT	highly valued target
VR	virtual reality

1 DEFENSE TECHNICAL  
(PDF) INFORMATION CTR  
DTIC OCA

1 DEVCOM ARL  
(PDF) FCDD RLD DCI  
TECH LIB

1 DEVCOM ARL  
(PDF) FCDD RLH B  
T DAVIS  
BLDG 5400 RM C242  
REDSTONE ARSENAL AL  
35898-7290

1 DEVCOM ARL  
(PDF) FCDD HSI  
J THOMAS  
6662 GUNNER CIRCLE  
ABERDEEN PROVING  
GROUND MD  
21005-5201

1 USAF 711 HPW  
(PDF) 711 HPW/RH K GEISS  
2698 G ST BLDG 190  
WRIGHT PATTERSON AFB OH  
45433-7604

1 USN ONR  
(PDF) ONR CODE 341 J TANGNEY  
875 N RANDOLPH STREET  
BLDG 87  
ARLINGTON VA 22203-1986

1 USA NSRDEC  
(PDF) RDNS D D TAMILIO  
10 GENERAL GREENE AVE  
NATICK MA 01760-2642

1 OSD OUSD ATL  
(PDF) HPTANDB B PETRO  
4800 MARK CENTER DRIVE  
SUITE 17E08  
ALEXANDRIA VA 22350

ABERDEEN PROVING GROUND

13 DEVCOM ARL  
(PDF) FCDD RLH  
J LANE  
YC CHEN  
P FRANASZCZUK  
A MARATHE  
K MCDOWELL  
K OIE  
FCDD RLH F  
J GASTON (A)  
FCDD RLH FA  
A DECOSTANZA  
FCDD RLH FB  
D BOOTHE (A)  
FCDD RLH FC  
K COX (A)  
S MOORE  
FCDD RLH FD  
A FOOTS (A)  
FCDD RLH FE  
D HEADLEY