

The Development and Validation of the Trust in Teams Scale and Trust in Leaders Scale – Preliminary Report

Barbara D. Adams
Humansystems® Incorporated

Prepared By:
Barbara D. Adams
Humansystems® Incorporated
111 Farquhar St.
Guelph, ON N1H 3N4

Contract Project Manager: Barbara D. Adams
(519) 836-5911
Contract #W7711-037893/001/TOR
Call up # 7893-02

CSA: Dr. Megan Thompson
(416) 635-2040

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Principal Author

Original signed by Barbara D. Adams

Barbara D. Adams

Humansystems® Incorporated

Approved by

Original signed by Megan M. Thompson

Megan M. Thompson

Defence Scientist, Collaborative Performance and Learning Section

Approved for release by

Original signed by K. C. Wulterkens

K. C. Wulterkens

for Chair, Document Review and Library Committee

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Abstract

This report represents the first draft of a paper describing the creation of scales to measure a) trust in teams and b) trust in a team leader in the context of army units. This work begins with an examination of the existing literature on the measurement of trust in others, trust in a leader and trust in teams, and the implications for measure development is reviewed. The scale development process for the trust in teams and trust in leader scales, including conceptual decisions is then described. The results of two studies exploring the psychometric properties of these scales also presented. We conclude with recommendations for further refinement.

Résumé

Le présent rapport représente la première ébauche d'un document décrivant la création d'échelles visant à mesurer a) la confiance en l'équipe et b) la confiance au chef d'équipe dans le contexte des unités de l'Armée de terre. Le présent document s'ouvre sur un examen de la documentation existante quant à la mesure de la confiance en d'autres personnes, en un chef et en une équipe, ainsi que l'examen des répercussions relatives à l'élaboration de mesures. On décrit ensuite le processus d'élaboration des échelles de confiance en l'équipe et au chef, concernant notamment des décisions conceptuelles. Les résultats de deux études des propriétés psychométriques de ces échelles sont également présentés. Enfin, nous recommandons d'autres pistes d'étude.

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Executive summary

The Development and Validation of the Trust in Teams Scale and Trust in Leaders Scale – Preliminary Report

Barbara D. Adams; DRDC Toronto CR 2008-120; Defence R&D Canada – Toronto; July 2008.

Trust has long been argued to be of critical importance within military teams. Despite its importance, however, there is currently no established measurement tool proven to provide valid measures of trust in teams or of trust in leaders. This report is the first draft of a article describing the development of the Trust in Team Scale and the Trust in Leader Scale, both assessing interpersonal trust in military teams.

Study 1 showed that the factors that underlie trust (i.e., predictability, integrity and benevolence) matched well with our predicted dimensions of trust in teams and trust in a leader, and with the theoretical descriptions of trust noted in the literature. Although the competence dimension was not distinctly captured in this first iteration of the Trust in Team Scale, the factor structure for the other dimensions was relatively simple, and the items loaded on the expected factors. The factor solutions accounted for 58% of the variance in trust in teams and 63.6% of the variance in trust in a leader. Integrity appeared to be the most important dimension within teams, and predictability was the most important dimension in assessing the trustworthiness of a leader.

Study 2 further refined the scales and reduced their length, as well as comparing the performance of both scales to other existing measures. The data again showed both scales to have a high level of internal consistency and to be highly correlated (but not wholly overlapping) with existing measures. This study also tested the dimensionality of the models and confirmed that in both cases a 4 factor model provided a better fit to the data than a 1 factor model, as well as showing the ability of the Team Trust scale to predict critical team outcomes (e.g., cohesion, morale).

Sommaire

The Development and Validation of the Trust in Teams Scale and Trust in Leaders Scale – Preliminary Report

Barbara D. Adams; DRDC Toronto CR 2008-120; R & D pour la défense Canada – Toronto; Juillet 2008.

On soutient depuis longtemps que la confiance revêt une importance cruciale au sein des équipes militaires. Cependant, il n'existe actuellement aucun outil de mesure établi permettant d'obtenir des données valides sur la confiance en l'équipe ou sur la confiance qu'inspire le chef. Le présent rapport est la première ébauche d'un article décrivant l'élaboration de l'échelle de confiance aux équipes et de l'échelle de confiance aux chefs, évaluant toutes deux la confiance interpersonnelle au sein des équipes militaires.

L'étude n° 1 a révélé que les facteurs qui sous-tendent la confiance (c.-à-d. la prévisibilité, l'intégrité et la bienveillance) correspondaient bien aux dimensions de la confiance qu'inspirent les équipes et le chef que nous avons prédites, ainsi qu'aux descriptions théoriques de la confiance mentionnées dans la documentation. Bien que la dimension relative à la compétence n'ait pas été clairement analysée dans cette première itération de l'échelle de confiance en l'équipe, la structure des facteurs pour les autres dimensions était relativement simple, et les éléments correspondaient aux facteurs prévus. Les solutions factorielles représentaient 58 p. 100 des écarts liés à la confiance aux équipes et 63 p. 100 des écarts liés à la confiance qu'inspire le chef. L'intégrité semblait être la dimension la plus importante au sein des équipes, et la prévisibilité s'est révélée la dimension la plus importante dans l'évaluation de la loyauté d'un chef.

L'étude n° 2 a permis d'affiner les échelles et d'en réduire la taille, ainsi que de comparer la valeur des deux échelles par rapport à d'autres mesures existantes. Les données ont de nouveau révélé que les deux échelles ont un niveau élevé de cohérence interne et de corrélation (mais ne se chevauchent pas entièrement) avec les mesures existantes. Cette étude a également mis à l'essai la dimensionnalité des modèles et a permis de vérifier que dans les deux cas, un modèle composé de quatre facteurs correspondait mieux aux données qu'un modèle composé d'un seul facteur, et elle a également démontré la capacité de l'échelle de confiance en l'équipe à prédire les résultats critiques de l'équipe (p. ex., cohésion, moral).

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The Development and Validation of the Trust in Teams Scale – Preliminary Report

Trust is fundamental to virtually all relationships and can be defined as “*the willingness to make oneself vulnerable to another person or another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party*” (Mayer, Davis, & Schoorman, 1995, p. 712). Trust is generally agreed to be comprised of three core components: competence (skills and knowledge), integrity (honour and honesty), and benevolence (genuine care and concern) (Mayer et al., 1995). An additional, influential and yet less commonly researched dimension of trust that is predictability (Adams & Webb, 2003).

Trust becomes especially critical in situations requiring interdependence with others, as well as those involving perceived risk, vulnerability, and uncertainty (Costa, Roe, & Tailleau, 2001; Rousseau, Sitkin, Burt, & Camerer, 1998). These features make trust particularly relevant to military contexts, as interdependence and risk are often the hallmarks of military teams in operations. Indeed, trust is considered a fundamental enabler of military teams (e.g., Scull, 1990), with higher trust levels being related to greater team cohesion, higher morale (Cassel, 1993), decreased team conflict (Simons & Peterson, 2000), higher performance and achievement (Ivy, 1995), greater citizenship behaviours (Deluga, 1995), and a more positive command climate (Cox, 1996).

Although measures of trust in teams and leaders exist (e.g., Cook & Wall, 1980; Costa et al., 2001; Cummings & Bromiley, 1996; Dirks, 1999; Korsgaard, Brodt, & Whitener 2002; McAllister, 1995; Podsakoff, Mackenzie, Moorman, & Fetter, 1990; Simons & Peterson, 2000), researchers often do not report complete psychometric analyses and measures tend to have variable reliability and validity. Those few measures developed for the military context (e.g., Shamir, Brainin, Zakay, & Popper, 2000; Shamir & Lapidot, 2003) seem to suffer from the same shortcomings.

In light of these shortcomings, a program of research was designed to develop theoretically based and psychometrically valid measures of trust in military teams and military leaders for use with small army units (i.e., section level). The current work is a preliminary report describing selected results from the two phases of the scale construction efforts. The first phase focused on creating pilot measures of trust in teams, trust in a leader, and on initial efforts to understand the validity of these scales. The second phase focused on confirming the underlying factor structure and exploring convergent validity (i.e., the extent to which the scales were correlated with other tests to which they should be conceptually related) and predictive validity (i.e., the extent to which the trust scales are related to criterion behaviours) of the scales with respect to perceptions of teamwork, cohesion, team morale, and combat readiness within military teams.

Considerations for Measures of Trust

Before creating measures of trust that would be usable within a military context, it was important to first consider the ideal characteristics of such scales. Understanding the future contexts in

which the scales would likely be administered was a critical consideration. Military teams perform in a range of environments, often in close proximity to each other, and face a range of both physical and psychological stressors. Therefore, the scales would need to be relatively easy and quick to administer.

Another important requirement was to ensure that the trust scales have face validity. Face validity, of course, refers to the extent to which a measure captures what it intends to capture. This can be difficult in a military domain where personnel are likely to dismiss the term “trust” as a “touchy-feely thing” (Adams & Webb, 2003). Measurement scales that strike military participants as depicting a view of trust which does not match their experience, or which captures trust in “head-shrinker” terms, may negatively influence how participants respond, and the scale will not be useful in the long run. As such, refraining from the direct use of trust terms was thought to be of some benefit.

Issues of trust become increasingly salient and important in situations involving risk, vulnerability, uncertainty and the need for interdependence. As such, scales to measure trust in teams and trust in a leader needed tap both trust related concepts (e.g., predictability and integrity), as well as create a context particularly likely to give rise to issues of trust (e.g., high levels of risk and uncertainty). In order to “push” for trust, then, some of the items were written to reflect a particularly risky context (e.g., “When it really counts, my teammates keep their promises”).

A decision was made to create scales that could be used to assess trust in more than one type of small team. These include varying kinds of military teams (e.g., armoured vehicle crews, command and control teams, Navy operations teams, anti-air warfare teams), as well non-military teams, such as emergency services crews (e.g., ambulance, firefighting teams), teams within organizations (e.g., management teams, product development teams), and other teams in which risk, vulnerability, and uncertainty are likely to be an issue. As such, scale items were created that would meaningfully reflect the kind of interactions required by military team members and leaders while ensuring that the items could also be applied to non-military teams.

Our initial item generation process followed typical test construction methodology (see Nunnally & Bernstein, 1994). Accordingly, the published literature relevant to trust in teams and trust in a leader was reviewed in order to identify key approaches to measuring trust in these areas. Focus groups were also conducted with members of armoured vehicle teams to obtain informal validation of the trust dimensions to be included in the scales. Given the feedback provided in these focus groups and the knowledge available in the existing literature, the goal at the outset was to create a broad range of scale items representing the four most influential trust factors in small teams and trust in a leader (i.e., competence, benevolence, integrity, and predictability). A number of items to measure less influential factors (e.g. communication, shared values) were also included. Including the additional factors allowed a test of assumptions that the four primary trust factors are the most influential factors in diverse types of military teams.¹ At this stage, 40 items were created for each of the 5 subscales (competence, integrity, benevolence, predictability, and communication/shared values) for both the trust in team and trust in leader scales. The decision to

¹ After initial exploration, it was evident that this subscale did not impact substantively, and it was not included in the subsequent analyses.

use a large number of items at the initial stage of scale creation was prompted by the novelty of the area and a need to understand the kinds of items that would work best within this domain.

Scale items were created by brainstorming each of the trust dimensions, generating alternate words related to these dimensions, and casting these ideas in terms of both general and specific contexts that would be relevant to small teams. Items for the trust in leader scale were created by changing the referent from team to leader. A military subject matter expert (SME) reviewed the full list of items to ensure face validity and intelligibility within the military domain.

Study 1

Study 1 explored the fit of the predicted “Trust in Teams” and “Trust in a Leader” dimensions to the scale data using exploratory factor analysis (EFA). The goal of this analysis was to understand the structure underlying the items, and to explore the extent to which this structure was consistent with the proposed dimensionality of trust.

Method

Participants

Participants were 197 Canadian Forces (CF) military personnel, 147 who responded as team members and 50 who responded as team leaders.² All 197 participants completed the Trust in Teams scale, 147 of which also completed the Trust in Leader scale. Participants showed a range of operational experience, with almost 40% having no experience, 22% with 1 tour, and 16% with 2 tours. Importantly, there was a good deal of familiarity with other team members at both a professional and a personal level, in that 85% of participants indicated that they knew their current team members well in a work context, and 86% indicated that they knew their current team members well at a personal level.

Measures

Trust in teams. Two hundred items (40 items for each of the 5 subscales) were included using a 7-point Likert scale, from 1 (completely disagree) to 7 (completely agree). A single item measure of trust within their team was also included, which rated the importance of trust in their military teams on a scale from 0 to 100.

Trust in leader. Two hundred items (40 items for each of the 5 subscales) were included using a 7-point Likert scale, from 1 (completely disagree) to 7 (completely agree). A single item measure of trust in their team leader was also included rated on a scale from 0 to 100.

Feedback about trust scale. An open-ended question was included to obtain feedback about individual scale items that were problematic. Participants were also asked to rate the extent to which the scale captured their view of trust in teams, failed to capture trust in teams, captured

² Data for 16 participants could not be used because they either failed to complete the questionnaires or failed to follow instructions.

their view of trust in a leader, and failed to capture trust in a leader. These questions were rated using a 7-point Likert scale, from 1 (completely disagree) to 7 (completely agree)

Procedure

Military personnel attended sessions in groups of 50 or 60 people, with each session ranging from 1 to 2.5 hours. When the session began, participants were told the purpose of the study and that their responses were anonymous, completed an informed consent, and then completed the survey packages. Participants completed the survey packages at separate desks and were encouraged to distribute themselves randomly throughout the testing room to lessen the likelihood that team members were adjacent to each other. Team members and team leaders completed the survey package in separate rooms to ensure that team members did not rate their team leaders while in the same room with their leader.

Results

Data from the Trust in Teams scale was analyzed in several steps. First, items with low item-total correlations were removed. A preliminary factor analysis was then conducted in order to explore the underlying structure of the data. This analysis showed that in both scales, competence items did not form a unique factor on their own, but appeared to be dispersed throughout the other dimensions. A decision was made to exclude the competence items from further analyses, and to focus on whether a meaningful factor structure could be ascertained with the remaining items.

A principal component factor analysis with varimax rotation provided the most interpretable factor structure. Trust in Teams Scale items with double loadings (.3 or greater) were excluded. Subsequent analyses showed three clear and distinct dimensions on which the benevolence, integrity and predictability subscales loaded distinctly on the expected underlying dimensions. This iterative process resulted in a total of 8 items for each of the integrity, benevolence and predictability subscales in the trust in team scale, as shown in Table 1.

As can be seen in Table 1, the reliability of these items was also very high with all alphas above .9. Moreover, these scale items explained over 58% of the overall variance in the team trust construct. For the trust in team scale, the first factor that emerged, integrity, accounted for the largest portion of the variance (32.8%), with predictability and benevolence also contributing significantly (17.5% and 8.0%, respectively).

Similar analyses were completed for the trust in leader scale. Items with low item-total correlations were removed. Preliminary analyses again showed that the competence items did not form a unique and distinct factor and were subsequently removed. Principal component factor analyses were then conducted on the benevolence, integrity and predictability subscales items. Scale items with double loadings (i.e., those items loading on two factors with a value of .3 or greater) were excluded. In all, these three factors accounted for 63.6% of the variance in the underlying construct (hypothesized to be trust in a leader). The structure that emerged matched the predicted trust dimensions (i.e., integrity, predictability, and benevolence) quite well, as shown in Table 2.

Analyses were then conducted to compare the single item measure of trust in teams and the single-item measure of trust in leader with these subscales. These analyses speak most directly to the validity of the newly developed trust scales. That is, if the trust in team scale does indeed measure trust in teams, we would expect the correlation between the trust scale measures and one's explicit trust in his team (as measured by the direct, single-item measure) to be relatively high. The relationship between the Trust in Teams scale measure and the single item measure of trust in teams was positive and significant ($r = .52, p < .01$). Similarly, the relationship between the single item measure and trust in leader scale measure was also positive and significant ($r = .35, p < .01$). These analyses provide some preliminary evidence of the validity of these measures.

In general, results showed that the first versions of the Trust in Teams scale and the Trust in Leader scales worked relatively well. For both scales, the factor structure was relatively simple, and the items loaded on the expected factors. Moreover, the factor solutions accounted for 58% of the variance in trust in teams, and 63% of the variance in trust in leader. The factors underlying trust in these two contexts (i.e., predictability, integrity, and benevolence) match well with our predicted dimensions of trust in teams and trust in leader. Integrity appeared to be the most important dimension within teams, and predictability was the most important dimension in assessing the trustworthiness of a leader.

One obviously problematic finding in this study was that competence items did not form a unique factor. Based on our review of the literature and on our focus groups with military personnel, competence is perhaps the most critical factor in small military teams. As such, failing to capture it adequately with this first iteration of scale was problematic. One possible explanation as to why these items did not work is that the competence items were too closely related to integrity, predictability, and benevolence. In the next iteration of the scale, it was critical to address this issue by developing items that tap more discrete and specific forms of competence. In addition, some minor changes in item wording were made in response to feedback from participants.

Study 2

In Study 1, the trust in teams and trust in leader scales worked relatively well. However, the competence items did not appear to have captured the underlying dimension of interest adequately. In Study 2, competence items were revised to tap competence using more domain-specific wording such as, "My team members follow instructions well", as well including broader items such as "My team leader is highly skilled". Additional competence items were included in both the Trust in Teams and Trust in Leader scales to better capture competence within these domains. The purpose of Study 2 was to explore the revised scales in terms of their structure, their relation to other existing measures, and their ability to predict important outcomes.

Method

Participants and Procedure

Participants were 220 Canadian Forces (CF) military personnel, 140 who responded as team members and 80 who responded as team leaders. The majority of respondents were males (95%)

serving in the combat arms (76%), 17-36 years of age (82%), had completed high school or some university or college (72%), and spoke English (96%).

All participants reported that they were currently members of a small team, with 99% reporting that their team had a leader. Although 29% of participants reported more than seven team personnel changes during the previous year, the majority indicated that they knew about 60% of the people in their team well in a work context. Sixty-nine percent of participants reported completing between one and four field exercises with a past military team. However, most participants (89%) also reported having had no operational experience with their current teams.

The procedure for Study 2 was the same as the procedure for Study 1.

Measures

Trust in teams and trust in leader scales. Stage 1 required the reduction and refinement of the 40-item trust in team scale and the 40-item Trust in Leader scale created for Study 1. Preliminary analyses revealed high redundancy among the items in the Trust in Teams scale, which allowed us to create a smaller set of items for each subscale with little or no impact on the psychometric properties of the scale. The deletion of redundant items was done by progressively removing the single item with the lowest item total correlation within each subscale and then recalculating the new reliability and item-total correlations.³ This operation continued until five items for each subscale remained.⁴ This left a 20-item Trust in Teams scale, comprised of competency, integrity, predictability and benevolence dimensions. All questions were rated on a 1 (completely disagree) to 7 (completely agree) scale. The same process was used to revise the trust in leader scale

Validity scales. Several scales were used to compare to the trust in team scale and others were used to compare to the trust in a leader scale.

Interpersonal trust scale. Zolin and Hinds' (2004) interpersonal trust scale was designed to measure trust within workplace teams within a non-military context. Subscales measure benevolence, ability, and integrity. The scale consists of nine items (e.g., "How often has this team member made an extra effort to make your job easier?") rated on a 5-point Likert scale, from 1=low frequency to 5=high frequency. Ratings for each subscale were then averaged to form a score of perceived trustworthiness. Within our sample, this scale had an overall reliability of .91.

Team trust. Van der Kloet's (2005) Team Trust Scale was designed to measure team trust within the military domain. Subscales measure honesty (integrity), predictability, benevolence, and competence. The scale consists of 12 items (e.g., "The level of education is high in my

³ Although it would have been preferable to split the sample and remove some respondents, but the small size of the sample precluded this option.

⁴ Based on the apparent strength of the subscales, it would have been possible to shorten even more. However, as this scale has been used only with military samples to this point, caution would dictate being careful about removing too many items, lest results change with another sample.

platoon”) rated on a four-point scale ranging from 1 (totally disagree) to 4 (totally agree). Within our sample, this scale had an overall reliability of .90.

Human Dimensions of Operations scale (HDO; originally called the Unit Climate Profile). Murphy and Farley’s (2000) HDO was designed to assess the ongoing milieu within military units. Subscales measure cohesion, morale, and confidence in leadership. The scale consists of 56-items (e.g., “I am confident in the combat abilities of soldiers in my platoon/troop”) rated on a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Only items relating primarily to competence of other team members and effectiveness in training exercises were used.

Confidence in the leader scale. Shamir, Brainin, Zakay, and Popper’s (2000) confidence in leader scale was designed to measure confidence in a military leader. The scale consists of 4 items (e.g., “I have complete trust in him”). Items are rated on a five-point from 1 (“Never”) to 5 (“Always”) and all items are summed into a single index of leader trust. We found the scale to have a reliability of $\alpha = .90$.

Trust in peers scale. A scale created by McAllister (1995) to measure managers’ trust in their peers was adapted to the military context for this research. The scale consists of nine items scale (e.g., “Given my team member’s past performance, I see no reason to doubt his competence.”) rated on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). We found this scale to have excellent reliability ($\alpha = .96$).

Trust in leader. Van der Kloet’s (2005) trust in leader scale was designed to measure trust in one’s leader (and specifically a platoon commander) within the military domain. For our purposes, the referent of the scale was changed from “platoon commander” to “team leader”. This scale is comprised of seven items (e.g., “If the platoon commander compliments me, I wonder if he is sincere”) with three response options: 0 (“Don’t know”), 1 (“Not true”), and 2 (“True”). We found the scale to have a reliability of $\alpha = .76$.

Results

Trust in team scale. As Table 3 indicates, the reliability of the overall trust in team scale as well as its subscales were excellent (α ’s = .87-.97). Descriptive analyses also revealed that soldiers agreed with positive team trust statements about their team from a “somewhat” to “very high” degree, with an overall mean of 5.18, and subscale means ranging from 4.96 (Benevolence) to 5.40 (Competence). The mean inter-item correlation was .59, slightly higher than the optimal range of between .15 and .50 described by Clark and Watson (1995). Participants responded relatively equally across the scale anchors and, therefore, distributions were not bimodal. Intercorrelations among the subscales, presented in Table 4, were all quite high, and all subscales were highly correlated with the total scale score (r ’s between .91 and .95).

The relation between the trust in team subscales and the validity scales was next explored. As shown in Table 5, the trust in team subscales were positively related to all of the validity scales, as was expected. Overall, however, there was no consistent pattern of differential correlations in which conceptually similar subscales from different measures produced higher intercorrelations than did proposed conceptually different dimensions on different scales (e.g., Zolin & Hinds’ Care and Team Trust Competence, 2004). Although there are patterns among the subscales that

are not entirely consistent, it is unclear whether this is due to the underlying structure of the trust in team scale or the comparison scales.

Given the failure to match similar subscales differentially and as the relatively high reliability coefficients and intercorrelations suggest conceptual redundancy, it was critical to attempt to understand the extent to which the data from this sample match the hypothesized structure of the trust in team scale. To do this, a confirmatory factor analyses was conducted comparing the fit of a one-factor versus a four-factor model. Although a four factor model of team trust was theorized, it was important to test other models that might also provide a good fit to the data. It would be reasonable to argue that the fine distinctions amongst different dimensions of trust might not be necessary, and to propose a model that simply depicts one simple undifferentiated trust construct. Such a model would have all scale items loading on a single dimension.

Results of these analyses indicate that the hypothesized model of trust as with four distinct but correlated factors provided a superior fit to the data than did the model of trust with a single dimension, both in terms of its fit indices as well as the direct comparison χ^2 value, as shown in Table 6.

Trust in leader scale. As shown in Table 7, the overall reliability of the trust in leader scale was very high ($\alpha = .97$) with a mean inter-item correlation of .62. Again, this level of internal consistency within the scale was higher than typically desirable, as described by Clark and Watson (1995). Participants reported relatively high levels of trust in their leaders, with an overall mean 5.24. Means ranged from 4.97 (Predictability) to 5.52 (Competence) for subscales, indicating that soldiers agreed with positive trust statements about their leader from a “somewhat” to “very high” degree. Although the previous items in the competence subscale did not perform well in the first iteration, the revised items appeared to capture competence reliably, as can be seen in Table 7.

Analyses were conducted to explore the performance of the trust in leader scale in relation to existing measures. These showed strong and significant (but not wholly overlapping) relationships between our trust in leader scale and these other available measures of leader trust, as can be seen in Table 8. The overall correlations among the four subscales and the trust in leader scale are shown in Table 9.

Confirmatory factor analyses were conducted to explore whether the trust in leader scale captures the dimensions underlying leader trust. Confirmatory factor analyses were used to test two different models, the hypothesized four factor correlated model, and a full model depicting leader trust as unidimensional construct underlying the trust in leader. Results of these analyses suggest that the four-factor model depicting competence, benevolence, integrity, and predictability as the most influential factors in trust in leader was superior to the single trust factor model. As shown in Table 10, $\Delta\chi^2$ statistic = 324.40, $p < .001$ meaning the four-factor model provides a significantly better fit to the data. In addition, the other indicators of fit (e.g. RMSEA) are also considerably better for the four-factor correlated model than the single factor model.

Team trust scale in relation to team outcomes. As mentioned earlier, trust is hypothesized to be important and relevant to many team-related behaviors. We, therefore, were also interested in the relation between the trust in team scale and participants’ self-reports concerning a number of trust-related team perceptions, including perceptions of teamwork,

morale, cohesion and combat readiness, as indexed by individual questions within the HDO instrument. Table 11 presents the results of four separate regressions, indicating that the trust in team subscales were important in each analysis. Specifically, trust in team significantly predicted 33% of the variance of perceived teamwork, $F(4, 215) = 26.28, p < .05$. As the beta weights show, this effect was driven by the Integrity and Competence subscales. Trust in team was similarly a significant predictor of 15% of the variance in perceived morale within one's platoon or troop, $F(4, 215) = 9.48, p < .001$. Again, only the Integrity and Competence subscales seemed to drive these effects. Trust in team also significantly predicted 21% of the variance in self-reported cohesion within the participants' platoon/troop $F(4, 215) = 13.86, p < .001$. Interestingly, in this case this effect was driven solely by the Competence dimension. Finally, the trust in team measure predicted 17% of the variance in perceived combat readiness, $F(4, 215) = 11.01, p < .001$. In this case, it is somewhat less surprising to see that perceived competence of one's teammates was the sole driver of the effect.

Discussion

In general, results of this research showed that the revised versions of the Trust in Teams and Trust in Leader scales worked quite well. The observed factor structures for both scales are relatively simple. Consistent with our theoretical conceptualizations concerning the nature of trust, the scale items load on the expected factors of benevolence, integrity, predictability, and competency dimensions. Direct comparisons of single and multidimensional models provide additional support for the superiority of the four-factor model of trust for both teams and leaders. Moreover, each of the subscales, as well as the overall measures, has excellent reliability scores. There is also good preliminary evidence for the validity of the trust scales. Results indicate that all subscales contributed to validity results. It was interesting that Benevolence appeared to be a more influential factor within the Trust in Leader scale than in the Trust in Team scale. Perhaps this makes sense, as it may be particularly important that people in a position of power be seen to have one's best interests at heart.

Despite these positive results, however, it is important to continue to consider the implications of the high internal consistency of the dimensions of trust. Scale construction efforts often represent a delicate balance, involving efforts to maintain both consistency and variability (Clark & Watson, 1995). However, increasing reliability may come at the expense of construct validity (and vice versa). And, although such psychometric details are not consistently reported, similarly high correlations were obtained within the other validity scales used in this work, suggesting such that such concerns may affect many of the measures in this area.

A related issue is the lack of a pattern of differential correlations among the Team Trust subscales and conceptually similar subscales from the validity scales. Such results could speak to the construct validity of the Zolin and Hinds (2004) or van der Kloet (2005) scales or to that of the Team and Leader Trust Scales. There is unfortunately no evidence suggesting that the underlying structure of the Zolin or van der Kloet scales have been assessed, although further confirmatory factor analyses may shed light upon this issue. At this point however, it would be most prudent to frame hypotheses involving the current scale at a holistic rather than subscale level, until it can be more broadly validated with a range of different samples, and refined as needed.

Reasonable next steps to this research program would be validating the scales with an independent sample from a different context, for instance, using a military sample from a

different nation, and utilizing incremental (Hunsley & Meyer, 2003) as well as multi-trait-multi-method approaches (Kenny, 1995) to construct validity, in particular establish evidence of discriminant validity. Further work addressing issues of predictive validity should also be undertaken, ideally using a longitudinal methodology. Nonetheless, the Trust in Teams and the Trust in Leaders measures in their current form have considerable value. They are based in theory, their dimensionality has been well established, and they perform well in relation to existing measures of trust in teams and in leaders, and we have evidence of criterion validity, at least with respect to the Team Trust Scale. Indeed, to date these scales appear to represent the best validated measures of trust in military teams and trust in team leaders that are currently available.

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2 Footnotes

¹We use an alpha-level of .05 throughout except when otherwise noted.

Table 1: Descriptives and Basic Psychometric Summary of the Trust in Teams Scale (Study 1)

Subscale	Item	\bar{X} (s.d.)	Item-Total r	α if deleted
Team Benevolence $\alpha = .85$ $\bar{X} = 4.44$ \bar{X} inter-item $r = .44$	My team shows interest in my personal pressures.	3.94 (1.58)	0.44	0.85
	In high risk situations, my team is motivated to protect me.	4.66 (1.48)	0.65	0.81
	In tough times, my team members are there to support me.	4.64 (1.40)	0.67	0.81
	My teammates worry about my well being.	4.28 (1.60)	0.65	0.81
	My team members are indifferent to my needs.	4.49 (1.58)	0.69	0.81
	I am sure that my teammates have my best interests in mind.	4.32 (1.42)	0.53	0.83
	If I really need them, my teammates are there for me.	4.77 (1.74)	0.58	0.82
Team Integrity $\alpha = .91$ $\bar{X} = 4.82$ \bar{X} inter-item $r = .54$	I know my teammates tell the truth.	4.72 (1.41)	0.61	0.91
	I can depend on the fairness of my teammates.	4.72 (1.33)	0.60	0.91
	When it really counts, my teammates keep their promises.	4.86 (1.43)	0.66	0.90
	No matter what, I can rely on the word of my team.	4.67 (1.59)	0.74	0.90
	I believe in the integrity of my team.	4.80 (1.43)	0.76	0.90
	During the toughest times, my teammates are honourable.	5.20 (1.32)	0.59	0.91
	Even when times are tough, I believe that my teammates have strong ethics.	4.78 (1.38)	0.80	0.89
	I have faith in the integrity of my teammates.	4.86 (1.41)	0.75	0.90
	I am confident about the integrity of my teammates.	4.80 (1.45)	0.71	0.90
Team Predictability $\alpha = .90$ $\bar{X} = 4.42$ \bar{X} inter-item $r = .54$	I know what to expect from my team.	4.63 (1.55)	0.73	0.88
	I never know what to expect from my teammates.	4.19 (1.66)	0.59	0.90
	One never knows what my teammates are likely to do.	4.60 (1.67)	0.66	0.89
	My teammates behave in a very consistent manner.	4.46 (1.54)	0.66	0.89
	My teammates' actions are reliable.	4.43 (1.66)	0.70	0.89
	Even when we run into hard times, I always know how my teammates are going to react.	4.47 (1.56)	0.70	0.89
	My team has a common understanding of what to do in high risk situations.	4.43 (1.59)	0.80	0.88
	I can often guess what my team members are likely to do.	4.17 (1.41)	0.69	0.89
Team Trust (Overall) $\alpha = .91$		4.58 (1.51)	-	-

Table 2: Descriptives and Basic Psychometric Summary of the Leader Trust Scale (Study 1)

Subscale	Item	\bar{X} (s.d.)	Item-Total r	α if deleted
Leader Integrity $\alpha = .84$ $\bar{X} = 4.29$ \bar{X} inter-item $r = .54$	I can depend on the fairness of my leader	4.25 (1.53)	0.74	0.80
	When it really counts, my leader breaks his promises - rev	4.50 (1.59)	0.73	0.80
	When times are tough, I know my leader will keep his word	3.88 (1.75)	0.57	0.84
	I believe that my leader is honest	4.53 (1.64)	0.60	0.83
	My leader has poor ethics – rev	4.29 (1.61)	0.67	0.82
Leader Predictability $\alpha = .79$ $\bar{X} = 4.44$ \bar{X} inter-item $r = .44$	In times of uncertainty, I know I can rely on my leader	4.46 (1.55)	0.59	0.75
	My leader behaves in a very consistent manner	4.54 (1.35)	0.55	0.76
	Even in the worst possible situations, I know how my leader is going to act	4.40 (1.59)	0.66	0.73
	I know exactly my leader will do in difficult situations	4.30 (1.45)	0.58	0.75
	I can anticipate my leader's actions before he does them	4.49 (1.33)	0.50	0.78
Leader Benevolence $\alpha = .80$ $\bar{X} = 4.20$ \bar{X} inter-item $r = .50$	My leader makes me feel valued	4.79 (1.55)	0.43	0.82
	My leader is genuinely concerned about my well being	4.10 (1.58)	0.75	0.67
	My leader cares personally about my survival	4.17 (1.77)	0.64	0.73
	My leader always has my best interests in mind	3.75 (1.61)	0.62	0.74
LeaderTrust (Overall) $\alpha = .85$		4.32 (1.56)	-	-

Table 3: Descriptives and Basic Psychometric Summary of the Trust in Teams Scale (Study 2)

Subscale	Item	\bar{X} (s.d.)	Item-Total r	α if deleted
Team Benevolence $\alpha = .92$ $\bar{X} = 4.96$ \bar{X} inter-item $r = .69$	I believe that my teammates have my best interests in mind.	4.78 (1.28)	0.75	0.90
	My team is motivated to protect me.	4.93 (1.30)	0.83	0.89
	I feel that my teammates work to protect me.	4.79 (1.35)	0.78	0.90
	My teammates watch my back.	5.21 (1.19)	0.79	0.90
	My teammates look out for me.	5.11 (1.25)	0.77	0.90
Team Integrity $\alpha = .91$ $\bar{X} = 5.16$ \bar{X} inter-item $r = .66$	I can depend on my teammates to be fair.	5.25 (1.14)	0.75	0.89
	My teammates are honourable people.	5.25 (1.11)	0.76	0.89
	My teammates honour their word.	5.07 (1.21)	0.72	0.89
	My teammates keep their promises.	5.16 (1.15)	0.83	0.87
	My teammates tell the truth.	5.07 (1.26)	0.76	0.88
Team Predictability $\alpha = .87$ $\bar{X} = 5.21$ \bar{X} inter-item $r = .58$	I know what to expect from my team.	5.34 (1.12)	0.75	0.83
	I usually know how my teammates are going to react.	5.00 (1.07)	0.63	0.86
	In times of uncertainty, my team sticks to the plan.	5.24 (1.09)	0.69	0.85
	My teammates are reliable.	5.29 (1.18)	0.71	0.84
	My teammates behave consistently.	5.18 (1.15)	0.70	0.84
Team Competence $\alpha = .91$ $\bar{X} = 5.40$ \bar{X} inter-item $r = .68$	My teammates are capable at their jobs.	5.49 (1.10)	0.84	0.88
	My teammates know what they are doing.	5.42 (1.13)	0.80	0.89
	I have faith in the abilities of my teammates.	5.37 (1.17)	0.81	0.89
	My teammates are qualified to do their job.	5.51 (1.22)	0.77	0.90
	My team members communicate well.	5.22 (1.07)	0.68	0.91
Team Trust (Overall) $\alpha = .97$		5.18 (1.18)	-	-

Table 4: Correlations – Team Trust subscales and Total Team Trust index

	Integrity Subscale	Predictability Subscale	Competence Subscale	Team Trust Index
Benevolence Subscale	0.83	0.79	0.75	0.92
Integrity Subscale		0.83	0.83	0.95
Predictability Subscale			0.78	0.92
Competence Subscale				0.91

Note: All correlations significant at $p < .05$.

Table 5: Correlations of Team Trust Subscales and Total Scale with Validity Scales

	TT Benev.	TT Integrity	TT Predict.	TT Compet.	TT Total
Z & H Care	0.38	0.47	0.45	0.49	0.49
Z & H Integrity	0.55	0.57	0.54	0.52	0.52
Z & H Ability	0.57	0.66	0.56	0.58	0.58
Z & H Total	0.57	0.63	0.58	0.58	0.58
VDK Benevolence	0.52	0.59	0.54	0.53	0.59
VDK Honesty	0.53	0.61	0.58	0.53	0.61
VDK Predictability	0.54	0.58	0.52	0.53	0.59
VDK Competence	0.50	0.56	0.49	0.52	0.56
VDK Total	0.59	0.67	0.61	0.60	0.67
HDO: confidence in platoon/troop combat abilities	0.39	0.43	0.40	0.51	0.47
HDO: Platoon/troop effective in field exercises	0.32	0.40	0.42	0.44	0.42
HDO: Overall platoon/troop effective in garrison	0.33	0.40	0.35	0.44	0.41
HDO: 3-item total	0.45	0.53	0.50	0.60	0.56

Notes: Numbers in bold-faced type indicate cells representing convergent validity scores.

Z & H = Zolin & Hind scales; VDK = van der Kloet scales; *r*'s of Z & H scales with TT Total excludes TT Predictability subscale as the Zolin and Hinds scale does not posit a predictability dimension.

Table 6: One versus Four Factor Team Trust Confirmatory Factor Analyses

Proposed Model	χ^2	df	GFI	TLI rho2	CFI	RMSEA	$\Delta\chi^2$	df
One factor	577.32	170	.77	.88	.89	.11	-	-
Hypothesized model (4 factors - all correlated)	395.50	164	.85	.93	.94	.08	182.82***	6

Notes: For all χ^2 , π , GFI = goodness of fit index; TLI rho2 = Tucker Lewis; CFI = comparative fit index; RMSEA = root mean square error of approximation, *** $p < .001$

Table 7: Descriptives and Basic Psychometric Summary of the Leader Trust Scale (Study 2)

Subscale	Item	\bar{X} (s.d.)	Item-Total r	α if deleted
Leader Benevolence $\alpha = .94$ $\bar{X} = 5.12$ \bar{X} inter-item $r = .76$	I have confidence in the motivations of my leader.	5.13 (1.46)	0.81	0.93
	My leader watches my back.	5.11 (1.48)	0.83	0.93
	My team leader has my best interests in mind.	5.09 (1.48)	0.85	0.92
	My leader is genuinely concerned about my well being.	5.01 (1.43)	0.84	0.93
	My team leader is likely to protect me.	5.24 (1.45)	0.85	0.92
Leader Integrity $\alpha = .89$ $\bar{X} = 5.38$ \bar{X} inter-item $r = .67$	I believe my leader is fair.	5.49 (1.44)	0.82	0.85
	I believe my leader is honest.	5.48 (1.32)	0.83	0.85
	I can depend on the fairness of my leader.	5.26 (1.51)	0.84	0.84
	My leader puts his words into action.	5.41 (1.51)	0.44	0.93
	I know my leader will keep his word.	5.25 (1.56)	0.78	0.86
Leader Predictability $\alpha = .90$ $\bar{X} = 4.97$ \bar{X} inter-item $r = .64$	I usually know how my leader is going to react.	4.87 (1.17)	0.81	0.86
	I can anticipate what my leader will do.	4.85 (1.22)	0.77	0.86
	I know exactly what my leader will do in difficult situations.	4.61 (1.14)	0.77	0.87
	I can rely on my leader to behave predictably.	5.11 (1.34)	0.66	0.89
	My leader behaves in a very consistent manner.	5.29 (1.19)	0.71	0.88
Leader Competence $\alpha = .95$ $\bar{X} = 5.52$ \bar{X} inter-item $r = .80$	My team leader performs his job well.	5.64 (1.21)	0.81	0.86
	I have confidence in the abilities of my team leader.	5.35 (1.44)	0.77	0.86
	My team leader is capable at his job.	5.67 (1.18)	0.77	0.87
	My team leader is highly skilled.	5.44 (1.33)	0.66	0.89
	My team leader knows what he is doing.	5.48 (1.28)	0.71	0.88
Leader Trust (Overall) $\alpha = .97$		5.24 (1.36)	--	--

Table 8: Leader Trust Scale vs. Zolin, McAllister and van der Kloet Scales

	Shamir Leader Trust	McAllister Leader Trust	van der Kloet Leader Trust
LT Benevolence Subscale	0.74	0.78	0.50
LT Integrity Subscale	0.74	0.79	0.49
LT Predictability Subscale	0.57	0.57	0.39
LT Competence Subscale	0.76	0.75	0.46
Leader Trust Index	0.78	0.81	0.51

Note: All correlations significant at $p < .05$.

Table 9: Correlations – Leader Trust subscales and Leader Trust index

	Integrity Subscale	Predictability Subscale	Competence Subscale	Leader Trust Index
Benevolence Subscale	0.84	0.69	0.82	0.94
Integrity Subscale		0.63	0.85	0.93
Predictability Subscale			0.68	0.82
Competence Subscale				0.93

Table 10: One vs. Four Factor Leader Trust Confirmatory Factor Analyses

Proposed Model	χ^2	df	GFI	TLI rho2	CFI	RMSEA	$\Delta\chi^2$	df
One factor	632.32	170	.636	.550	.836	.143	-	-
Hypothesized model (4 factors - all correlated)	307.92	164	.82	.941	.949	.081	324.40***	6

Note: For all χ^2 , $\pi < .01$, GFI = goodness of fit index; TLI rho2 = Tucker Lewis; CFI = comparative fit index; RMSEA = root mean square error of approximation, ***p < .001

Table 11: Regressions of Team Trust Subscales on HDO Perception of Teamwork, Morale, Cohesion, & Combat Readiness (N=220)

	The soldiers in my platoon/troop encourage each other to work as a	Platoon/troop level morale is very high.	There is a lot of togetherness in my platoon/troop.	My platoon/troop is ready for combat.
Overall R ²	0.33**	.15*	0.21*	.17*
Benevolence β	-0.01	-0.12	0.08	-0.08
Integrity β	0.39**	0.29**	0.19	-0.01
Predictability β	-.10	-0.09	-0.12	-0.06
Competence β	0.31**	0.29**	0.31**	0.46**

*p < .05, **p < .001

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This report represents the first draft of a paper describing the creation of scales to measure a) trust in teams and b) trust in a team leader in the context of army units. This work begins with an examination of the existing literature on the measurement of trust in others, trust in a leader and trust in teams, and the implications for measure development is reviewed. The scale development process for the trust in teams and trust in leader scales, including conceptual decisions is then described. The results of two studies exploring the psychometric properties of these scales also presented. We conclude with recommendations for further refinement.

Le présent rapport représente la première ébauche d'un document décrivant la création d'échelles visant à mesurer a) la confiance en l'équipe et b) la confiance au chef d'équipe dans le contexte des unités de l'Armée de terre. Le présent document s'ouvre sur un examen de la documentation existante quant à la mesure de la confiance en d'autres personnes, en un chef et en une équipe, ainsi que l'examen des répercussions relatives à l'élaboration de mesures. On décrit ensuite le processus d'élaboration des échelles de confiance en l'équipe et au chef, concernant notamment des décisions conceptuelles. Les résultats de deux études des propriétés psychométriques de ces échelles sont également présentés. Enfin, nous recommandons d'autres pistes d'étude

14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

Trust in Leader Scale, Trust in Team Scale, scale development, scale validation