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Effectiveness of a Co-Designed International Humanitarian Law Training Intervention in Improving Knowledge, Attitudes and Compliance Practices Among Weapon Bearers in Eastern Democratic Republic of Congo: A Quasi-Experimental Study

Thierry Mugisho Byandi[1*]; Leo Juma Ogallo[2]; Dr. Kennedy Indembukhani[3]

[2]Professor
[1;2;3]Great Lakes University of Kisumu, Kenya

Corresponding author: Thierry Mugisho Byandi[1*]

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Abstract:

- ***Background:***

International Humanitarian Law (IHL) may not lead to more peaceful conflict conduct. Training may not be effective if it fails to take into account the practical, cultural, educational and organisational context of weapon bearers. This study aimed to assess the effectiveness of a co-designed IHL and humanitarian principles training package given to weapon bearers aligned to the government in Eastern DRC.

- ***Materials and Methods:***

A sequential, mixed-methods, non-randomised quasi-experimental study with a non-equivalent control group pre-post test design was undertaken. Quantitative data from 286 weapon bearers (143 intervention and 143 control) from government-aligned formations in North and South Kivu were collected. Weapon bearers were sampled via a multi-stage method with permission from the command. The intervention model was developed following focus group discussions, key informant interviews, 4 participatory design workshops and 3 rounds of Delphi validation. A structured questionnaire was used to collect data on knowledge, attitude and reported practice. Difference-in-Differences (DiD) estimates were calculated to compare differences in change between the groups. Thematic analysis was applied to qualitative data.

- ***Results:***

A total of 35.3% had heard of IHL at baseline. The mean knowledge score was 6.23 out of 17 (SD=2.13), the mean attitude score was 28.15 out of 60 (SD=4.70), and the mean self-reported compliance score was 18.85% (SD=12.70). The intervention group saw a significant increase in their knowledge score from 6.20 to 14.80, compared with 6.27 to 6.45 for the comparison group. This represented an improvement of +8.42 points (95%CI: 7.15-9.69) (p<.001) (d=1.85). Attitudes also increased significantly from 28.10 to 39.80 compared to 28.20 to 29.00, an improvement of +10.90 (95%CI: 8.70-13.10) (p<.001) (d=0.93). Composite self-reported compliance score increased from 18.5% to 46.4% compared with the comparison group, which increased from 19.2% to 20.3%. This is an improvement of +26.8% (95%CI: 21.7-31.9) (p<.001) (d=0.88)). Seven of the eight compliance indicators showed significant improvements. Willingness to refuse unlawful orders did show improvements; however, this was not statistically significant (p=.058). Qualitative results identified barriers to compliance, including training, language, literacy, commander accountability, legal advice, feelings of uncertainty and lack of trust within the community.

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➢ ***Conclusion:***

The results highlight the potential for training interventions in IHL designed with local context to significantly increase knowledge, attitudes and self-reported practices. However, self-reported practice does not necessarily reflect actual behaviour on the battlefield. Sustained compliance requires that training is combined with clear command responsibilities, verifiable reporting and accountability mechanisms and ongoing reinforcement.

Keywords: *International Humanitarian Law; Co-Designed Training; Weapon Bearers; Knowledge, Attitudes and Practices; Compliance; Eastern Democratic Republic of Congo; Quasi-Experimental Study.*

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I. INTRODUCTION

International humanitarian law refers to a set of rules used during armed conflict to regulate the actions of those involved and reduce its impact from a humanitarian point of view. Some core principles include distinguishing combatants from non-combatants, proportionality, taking all necessary precautions before attacking, and treating the wounded, sick and prisoners humanely. Medical and humanitarian staff should also be protected. These principles are covered in the Non-international armed conflicts by Common Article 3 of the Geneva Conventions and Additional Protocol II. These principles are also supplemented by Customary International Humanitarian Law. All parties to an armed conflict, including armed forces from states and organised non-State armed groups, are bound by these principles. [1,2]

An ongoing issue in modern conflict is the difference between IHL being accepted or recognised at a formal level and its practical implementation. Whilst training can play an important role, knowledge of the law may not necessarily drive behaviour. The ICRC defines incorporating IHL into armed forces as an ongoing process involving doctrine development, education, training, equipment, leadership and punitive measures. [3] Studies on actors within the armed forces have shown that they consider humanitarian norms to be respected based on their perception of legitimacy, conformity to group norms, military benefit, command authority, identity and organisational responsibility. [4 -8,17]

This is especially important in the context of the eastern DRC due to the complex security and conflict situation, with numerous armed actors, displaced populations and challenging security situations. Weapon bearers have been trained in these contexts. However, only Government aligned Armed Forces of the Democratic Republic of the Congo (FARDC) and Wazalendo/Volontaires pour la Défense de la Patrie (VDP) auxiliary personnel were included in the quantitative part of the study. Non-state armed actors were excluded from the evaluation due to safety risks and limitations in access. The co-design was implemented due to the increased likelihood of the training content being better understood and applied by the target audience if they are involved in the design of the curriculum. Co-design can incorporate practical knowledge from those delivering the training into the curriculum, using localised language and catering to how adults like to learn. [9] Recently there has also been an emphasis on practical scenarios, ethical considerations, and leadership in military training, including International Humanitarian Law. [5 -7]

The study aimed to assess baseline knowledge, attitudes and practice around compliance and identify training needs; co-design and validate an IHL and humanitarian principles training solution; assess changes in knowledge, attitudes and self-reported practice; and identify factors at individual, institutional, operational and community level which impacted on compliance. This article outlines the quantitative findings relating to the effectiveness of the intervention. The co-design process and qualitative results are presented to provide an explanation for how the intervention was designed to address the issues faced in the local context.

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II. MATERIALS AND METHODS

➢ *Study Design*

The study used a sequential mixed-methods quasi-experimental design. Quantitative data were gathered to compare the baseline and endline results between the intervention and comparison groups. Participatory approaches were used to inform the development and validation of the training model. Qualitative data were gathered using interviews and focus groups to identify training needs, learning styles, implementation factors and barriers to adherence. Due to operational security and command issues that restricted access to active weapon bearers and the risk of contamination due to personnel working in the same formations, random allocation was not utilised. Therefore, the design was interpreted using existing guidance on quasi-experimental non-equivalent comparison group designs. [10,11].

➢ *Study Setting and Population*

The study was carried out in Eastern DRC amongst armed individuals who were either deployed or stationed in specific parts of North and South Kivu. Intervention sites were the Goma, Karisimbi and Nyiragongo areas of North Kivu and comparison sites were the Bukavu and Uvira urban agglomerations in South Kivu. This included the Kadutu, Ibanda and Bagira health zones. The quantitative study involved a sample of active-duty FARDC and pro-government Wazalendo/VDP members. Qualitative work and co-design were carried out by PNC officers, ex-armed group members partaking in DDR processes, humanitarian actors, commanders, community representatives and IHL/Legal experts. However, these individuals were not part of the 286 individuals who formed the quantitative effectiveness sample.

➢ *Sample Size and Sampling*

A sample size of 302 participants was planned for the quantitative analysis of this study (n=151 per group). This was adjusted for sample size and attrition. 286 participants completed the study questionnaires and were included in the final analysis (n=143 intervention, n=143 comparison) (response rate = 94.7%). Multi-stage, command-approved sampling was used to select participants. Areas and formations were purposefully selected, and within these nominal rosters, participants were stratified by force type and rank category. Systematic sampling was carried out to select individuals for the study. The recruitment and consent process was carried out individually and not in front of commanders. For the qualitative analysis, participants were purposefully selected to ensure a variety of force types, ranks, roles and community experiences. Information power and thematic saturation were utilised to determine the sample size [16].

➢ *Co-Design and Intervention Development*

A total of 91 stakeholders were engaged throughout the co-design process, including 48 weapon bearers, 14 community representatives, 12 humanitarian practitioners, nine security stakeholders, and eight IHL/legal experts. This included 8 focus group discussions during the initial needs assessment process, 15 baseline key informant interviews, 4 co-design workshops and 3 rounds of Delphi validation. Co-design took place between March 2024 and January 2025 across North Kivu, South Kivu and Ituri. Weapon bearers were involved as end users throughout the needs assessment stages, during the design process, and to provide feedback during piloting. IHL/legal experts provided their expertise during technical review.

Four key themes were identified during the qualitative phase of the research: (i) the disconnect between legal knowledge and application, (ii) barriers to effective IHL training, (iii) preference for context-specific model development and (iv) organisational and community factors. The model was developed to be highly contextual, with case studies, scenarios, group-facilitated discussions, and bilingually delivered, visual and verbal resources. The program also included sensitive content to be facilitated by male and female facilitators, with follow-up and command support. The detailed curriculum contained within the results section includes 8 teaching modules and a final applied exercise (Table 12).

➢ *Data Collection Instruments and Variables*

Quantitative data were obtained through a structured interview tool developed within Open Data Kit. This consisted of six sections: demographic and service variables, past exposure to IHL training, training needs, knowledge related to IHL and humanitarian principles, attitude (measured using 5-point Likert scales), self-reported practice and barriers to behaviour change. Knowledge had a maximum score of 17 and attitude a maximum of 60. Practice included attempts to identify civilians (1), sharing IHL information with peers (2), knowledge of reporting channels (3), willingness to report breaches (4), attempts to protect civilians (5), attending briefings (6), appropriate detainee procedures (7) and willingness to disobey unlawful orders (8). Qualitative data collection tools included focus group discussion (FGD) and key informant interview (KII) guides, a co-design workshop guide, a training observation checklist and training evaluation tool.

A content validity check was undertaken by a panel of experts. A detailed description of how the content validity index was calculated is included within the thesis. Items and scales had a minimum requirement of 0.83 [14]. Internal consistency, test-retest reliability and intercoder reliability were defined. Internal consistency was measured using Cronbach's alpha [15].

➢ *Data Collection and Analysis*

The questionnaire was completed at the beginning and end of the project. The end-point was aimed to be between 8-12 weeks after the training intervention. Data were analysed using SPSS version 27 and R. Qualitative data were analysed using NVivo. Thematic analysis was performed as per standard qualitative analysis methodology [13]. Descriptive analysis was used to summarise the characteristics of the sample and the general knowledge, attitude and practice profile of the sample. Independent t-tests and chi-square tests were used to compare baseline characteristics between groups. A primary effectiveness measure was the difference-in-differences (DiD). This was calculated by finding the difference between end-line and baseline scores for the intervention group and then subtracting the difference between

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end-line and baseline scores for the control group. Confidence Intervals, p-values and Cohen's D (for continuous variables) and Odds Ratios (for some binary variables) are reported. A nominal alpha value of $p<0.05$ was used. For the knowledge items, a Bonferroni correction was applied to give an alpha value of $\alpha=.003$.

➢ *Ethical Considerations*

Ethical approval was obtained from the Great Lakes University of Kisumu Scientific and Ethical Review Committee (GLUSERC) together with the appropriate National Ethics Authority within the DRC, military clearance and appropriate Provincial Civil/Military coordination committees. Participants provided voluntary informed consent, were recruited privately, and could refuse to answer certain questions or withdraw from the study at any time. Data was anonymised and stored electronically using encryption. Consent forms were stored separately and information obtained from the research would not be used for prosecution. As participants were active weapon bearers it was important to ensure that they were protected from coercion, self-incrimination and disclosure of sensitive operational information. This is in line with ethical guidelines for research in conflict settings.[12].

III. RESULTS

➢ *Response Rate and Baseline Comparability*

302 participants were targeted and 286 were included in the final analysis (94.7% response). The final sample was evenly distributed between intervention (n=143) and comparison (n=143). There were no significant differences between the two groups in terms of sociodemographic and service-related variables at baseline (Table 1). Overall, males made up the majority of the sample (87.4%) and most fell within the 25 -34 age group (37.4%). Over four fifths had previous combat deployment experience (84.6%) but only 16.4% had received any previous IHL/laws-of-war training. The main language spoken was Swahili (74.5%).

Table 1 Baseline Sociodemographic and Service Characteristics of Weapon Bearers by Study Arm (N=286)

Characteristic	Category	Intervention n=143	Comparison n=143	Total N=286	χ^2	df	p
Sex	Male	124 (86.7)	126 (88.1)	250 (87.4)	.28	2	.869
	Female	16 (11.2)	15 (10.5)	31 (10.8)			
	Other/prefer not to say	3 (2.1)	2 (1.4)	5 (1.7)			
Age category (years)	18 -24	45 (31.5)	43 (30.1)	88 (30.8)	.54	4	.969
	25 -34	52 (36.4)	55 (38.5)	107 (37.4)			
	35 -44	28 (19.6)	26 (18.2)	54 (18.9)			
	45 -54	12 (8.4)	14 (9.8)	26 (9.1)			
	≥55	6 (4.2)	5 (3.5)	11 (3.8)			
Marital status	Single	60 (42.0)	63 (44.1)	123 (43.0)	.35	3	.950
	Married	72 (50.3)	68 (47.6)	140 (49.0)			
	Widowed	5 (3.5)	6 (4.2)	11 (3.8)			
	Divorced/separated	6 (4.2)	6 (4.2)	12 (4.2)			
Highest education	No formal education	15 (10.5)	18 (12.6)	33 (11.5)	.69	5	.983
	Primary incomplete	35 (24.5)	32 (22.4)	67 (23.4)			
	Primary complete	40 (28.0)	42 (29.4)	82 (28.7)			
	Secondary incomplete	32 (22.4)	30 (21.0)	62 (21.7)			
	Secondary complete	16 (11.2)	17 (11.9)	33 (11.5)			
	Tertiary/university	5 (3.5)	4 (2.8)	9 (3.1)			
Rank category	Officer	22 (15.4)	20 (14.0)	42 (14.7)	.23	2	.891
	Non-commissioned officer	45 (31.5)	48 (33.6)	93 (32.5)			
	Other rank/auxiliary	76 (53.1)	75 (52.4)	151 (52.8)			
Years of service	<1 year	18 (12.6)	20 (14.0)	38 (13.3)	.48	5	.993
	1 -3 years	40 (28.0)	38 (26.6)	78 (27.3)			
	4 -6 years	35 (24.5)	36 (25.2)	71 (24.8)			
	7 -10 years	25 (17.5)	27 (18.9)	52 (18.2)			
	11 -15 years	15 (10.5)	14 (9.8)	29 (10.1)			
	>15 years	10 (7.0)	8 (5.6)	18 (6.3)			
Previously deployed in combat	Yes	120 (83.9)	122 (85.3)	242 (84.6)	.11	1	.740
	No	23 (16.1)	21 (14.7)	44 (15.4)			
Previous formal IHL training	Yes	25 (17.5)	22 (15.4)	47 (16.4)	.23	1	.631

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	No	118 (82.5)	121 (84.6)	239 (83.6)			
Religion	Catholic	65 (45.5)	68 (47.6)	133 (46.5)	.38	4	.984
	Protestant	55 (38.5)	52 (36.4)	107 (37.4)			
	Muslim	10 (7.0)	11 (7.7)	21 (7.3)			
	Other	5 (3.5)	4 (2.8)	9 (3.1)			
	None	8 (5.6)	8 (5.6)	16 (5.6)			
Primary language	Swahili	105 (73.4)	108 (75.5)	213 (74.5)	.44	4	.979
	French	12 (8.4)	10 (7.0)	22 (7.7)			
	Kinyarwanda	15 (10.5)	14 (9.8)	29 (10.1)			
	Mashi	8 (5.6)	9 (6.3)	17 (5.9)			
	Other	3 (2.1)	2 (1.4)	5 (1.7)			

- *Note. Values are n (%). Percentages are within study arm. Chi-square statistics are reported once per characteristic. No measured characteristic differed significantly between arms at baseline. Source: thesis, Table 1.*

➢ *Baseline Awareness and Sources of IHL Information*

Only 101 participants (35.3%) reported having prior knowledge of IHL/laws of war. There was little difference between the intervention and comparison group (36.4% and 34.3%; χ^2=0.17), p=.678. Of these only 52.5% reported having received any mention during unit briefings/commander. 40.6% from ICRC or other humanitarian actors, 32.7% from peers and 29.7% from Radio/Other media. Only 21.8% of participants who had prior knowledge had received it during formal military/basic training and only 8.9% from the military legal advisor.

Table 2 Baseline Awareness of IHL and Sources of Information (N=286; Source Question Among n=101 Aware Participants)

Variable	**Response/source**	**Intervention**	**Comparison**	**Total**	**χ^2**	**df**	**p**	**OR (95% CI)**
Ever heard of IHL/laws of war	Yes	52 (36.4)	49 (34.3)	101 (35.3)	0.17	1	.678	1.10 [0.67, 1.78]
	No	91 (63.6)	94 (65.7)	185 (64.7)				
Main information source*	Formal military/basic training	12 (23.1)	10 (20.4)	22 (21.8)				
	Unit briefing/commander	28 (53.8)	25 (51.0)	53 (52.5)				
	Military legal adviser (JAG)	5 (9.6)	4 (8.2)	9 (8.9)				
	ICRC/other humanitarian actor	20 (38.5)	21 (42.9)	41 (40.6)				
	Peer/fellow soldier	18 (34.6)	15 (30.6)	33 (32.7)				
	Radio/media	14 (26.9)	16 (32.7)	30 (29.7)				
	Other	2 (3.8)	1 (2.0)	3 (3.0)				

- *Note. *Multiple responses were permitted for source of information; percentages are among participants who had heard of IHL (intervention n=52; comparison n=49). Source: thesis, Table 2.*

➢ *Baseline Knowledge of IHL and Humanitarian Principles*

Overall baseline item level knowledge was poor. The highest proportion of correct answers were on the knowledge that there are rules agreed upon in armed conflict (55.6%), and that health facilities are protected (53.8%). This was followed by a lower proportion knowing that humanitarian workers are protected (46.5%) and the difference between combatants and civilians (42.0%). The lowest correct answer proportions were knowledge that commanders are responsible (35.0%), impartiality (34.6%), no torture of prisoners of war (30.4%), independence (24.1%), no undue harm to civilians (25.5%) and not following illegal orders to attack civilians (20.6%). Only 14.7% said they disagreed that humanitarian aid should be decided by armed actors. There were no significant differences between groups for any of the baseline knowledge items.

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Table 3 Item-Level Baseline Knowledge of Core IHL and Humanitarian Principles (N=286)

Correct knowledge statement	Intervention n (%)	Comparison n (%)	Total n (%)	df	χ^2	p	OR (95% CI)
C3. Distinguish civilians from combatants (True)	62 (43.4)	58 (40.6)	120 (42.0)	1	.23	.630	1.12 [0.70, 1.79]
C4. Acceptable to attack civilian places (False)	65 (45.5)	62 (43.4)	127 (44.4)	1	.12	.720	1.09 [0.68, 1.74]
C5. Excessive civilian harm is prohibited (True)	35 (24.5)	38 (26.6)	73 (25.5)	1	.16	.686	0.90 [0.53, 1.52]
C6. Take precautions to minimize harm (True)	52 (36.4)	49 (34.3)	101 (35.3)	1	.13	.710	1.10 [0.67, 1.78]
C7. Health facilities are protected (True)	78 (54.5)	76 (53.1)	154 (53.8)	1	.05	.811	1.06 [0.66, 1.68]
C8. Schools receive no special protection (False)	58 (40.6)	55 (38.5)	113 (39.5)	1	.13	.716	1.09 [0.68, 1.75]
C9. Captured fighters may be tortured (False)	42 (29.4)	45 (31.5)	87 (30.4)	1	.14	.702	0.91 [0.55, 1.50]
C10. Humanitarian workers are protected (True)	68 (47.6)	65 (45.5)	133 (46.5)	1	.12	.722	1.09 [0.68, 1.73]
C11. There are no agreed rules at all (False)	81 (56.6)	78 (54.5)	159 (55.6)	1	.13	.715	1.09 [0.68, 1.74]
C12. Obey illegal orders to attack civilians (False)	28 (19.6)	31 (21.7)	59 (20.6)	1	.19	.661	0.88 [0.50, 1.56]
C13. Commander responsibility (True)	48 (33.6)	52 (36.4)	100 (35.0)	1	.24	.619	0.88 [0.54, 1.44]
C14. Humanity/address suffering (True)	65 (45.5)	63 (44.1)	128 (44.8)	1	.05	.812	1.06 [0.66, 1.69]
C15. Help only one side (False)	45 (31.5)	42 (29.4)	87 (30.4)	1	.14	.703	1.10 [0.67, 1.83]
C16. Neutrality/do not take sides (True)	55 (38.5)	59 (41.3)	114 (39.9)	1	.23	.627	0.89 [0.55, 1.43]
C17. Impartiality/aid based on need (True)	48 (33.6)	51 (35.7)	99 (34.6)	1	.14	.707	0.91 [0.56, 1.48]
C18. Independence/autonomous action (True)	35 (24.5)	34 (23.8)	69 (24.1)	1	.01	.902	1.04 [0.60, 1.79]
C19. Armed actors decide aid recipients (False)	22 (15.4)	20 (14.0)	42 (14.7)	1	.11	.738	1.12 [0.58, 2.15]

- *Note. The percentages represent participants giving the correct response. All between-arm baseline comparisons were non-significant. Source: thesis, Table 3.*

Table 4 Baseline Composite IHL Knowledge Score by Study Arm

Knowledge score metric	Intervention n=143	Comparison n=143	Total N=286	t (284)	p	95% CI for mean difference	Cohen's d
Mean (SD), range 0 -17	6.20 (2.15)	6.27 (2.12)	6.23 (2.13)	-0.325	.745	[-0.57, 0.43]	-0.03
Minimum score	1	2	1	-	-	-	-
Maximum score	13	12	13	-	-	-	-

- *Note. Baseline mean knowledge was 6.23/17 (36.6% of the maximum possible score). Source: thesis, Table 4.*

➢ *Baseline Attitudes Toward IHL and Humanitarian Principles*

Participants had a weak to moderate attitude towards IHL and humanitarian principles. The highest level of agreement was shown for the importance of following laws of war (M=3.15, SD=1.05). The lowest agreement was seen for refusing to follow an unlawful order (M=1.65, SD=0.65) and reporting breaches without fear (M=1.85, SD=0.75). There was also a low level of agreement relating to trust in organisations working in the humanitarian sector and confidence in identifying breaches. There were no significant differences between the intervention and comparison conditions on any of the attitude items (all p>.05).

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Table 5 Item-Level Baseline Attitudes Toward IHL and Humanitarian Principles (1 -5 Scale; N=286)

Attitude item	Intervention M (SD)	Comparison M (SD)	Total M (SD)	t (284)	p	95% CI	d
D1. Important to respect laws of war	3.10 (1.10)	3.20 (1.00)	3.15 (1.05)	-0.80	.423	[-0.34, 0.14]	-0.10
D2. Civilians before tactical goal	2.30 (0.90)	2.40 (1.00)	2.35 (0.95)	-0.89	.374	[-0.32, 0.12]	-0.11
D3. Trust NGOs to act fairly	2.10 (0.80)	2.10 (0.90)	2.10 (0.85)	0.00	1.000	[-0.20, 0.20]	0.00
D4. Report violations without fear	1.80 (0.70)	1.90 (0.80)	1.85 (0.75)	-1.13	.261	[-0.28, 0.07]	-0.13
D5. Everyone deserves aid	2.50 (1.00)	2.60 (1.10)	2.55 (1.05)	-0.80	.422	[-0.34, 0.14]	-0.10
D6. IHL makes unit more effective	2.30 (0.90)	2.20 (0.90)	2.25 (0.90)	0.94	.349	[-0.11, 0.31]	0.11
D7. Personal responsibility to know rules	2.80 (1.10)	2.70 (1.00)	2.75 (1.05)	0.80	.422	[-0.14, 0.34]	0.10
D8. Encourage peers to follow IHL	2.40 (0.80)	2.50 (0.90)	2.45 (0.85)	-0.99	.321	[-0.30, 0.10]	-0.12
D9. NGOs operate independently	2.20 (0.90)	2.10 (0.80)	2.15 (0.85)	0.99	.321	[-0.10, 0.30]	0.12
D10. Confident in recognizing violations	2.40 (1.00)	2.30 (1.10)	2.35 (1.05)	0.80	.423	[-0.14, 0.34]	0.10
D11. Refuse unlawful order	1.60 (0.60)	1.70 (0.70)	1.65 (0.65)	-1.30	.194	[-0.25, 0.05]	-0.15
D12. Commanders take compliance seriously	2.60 (1.00)	2.50 (1.10)	2.55 (1.05)	0.80	.422	[-0.14, 0.34]	0.10

- *Note. All items used a five-point response scale. The thesis reports no significant baseline difference for any item. Source: thesis, Table 5.*

The composite attitude score was 28.15/60 (SD=4.70). Overall, more than half of participants (55.6%) had negative/resistant attitudes, 40.9% had neutral/ambivalent attitudes and only 3.5% had positive/receptive attitudes. There were no significant differences in mean composite attitudes or distribution across categories between study arms.

Table 6 Baseline Composite Attitude Score and Attitude Categories (N=286)

Attitude metric/category	Intervention n=143	Comparison n=143	Total N=286	Test statistic	p	95% CI / OR (95% CI)	d
Composite mean (SD), 0 -60	28.10 (4.80)	28.20 (4.60)	28.15 (4.70)	-0.19	.849	[-1.19, 0.99]	-0.02
Minimum score	14	15	14	-	-	-	-
Maximum score	42	41	42	-	-	-	-
Negative/resistant (12 -28)	81 (56.6%)	78 (54.5%)	159 (55.6%)	0.13	.938	OR 1.09 [0.68, 1.74]	-
Neutral/ambivalent (29 -43)	57 (39.9%)	60 (42.0%)	117 (40.9%)	-	-	OR 0.92 [0.57, 1.47]	-
Positive/receptive (44 -60)	5 (3.5%)	5 (3.5%)	10 (3.5%)	-	-	OR 1.00 [0.28, 3.53]	-

- *Note. The composite comparison used an independent-samples t test; categorical distribution: $\chi^2(2)=0.13$, $p=.938$. ORs compare each attitude category by arm. Source: thesis, Table 6.*

➢ *Baseline Self-Reported Compliance Practices*

At baseline there were low self-reported rates of compliance. Only 16.1%, 16.8%, 28.3% and 14.3% reported making deliberate attempts to differentiate between civilians and combatants, sharing information on International Humanitarian Law (IHL), knowing the correct internal reporting route and reporting witnessed violations respectively. A quarter (25.9%) reported implementing protections for civilians, 14.7% had attended an IHL briefing recently and 21.0% were following correct processes for detainees. Only 11.2% would refuse to comply with an order that would breach the laws of war. In addition, 60.1% would not refuse and 28.7% were unsure. No significant differences were observed in the distribution of responses to baseline questions between study arms.

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Table 7 Complete Baseline Response Distributions for Self-Reported IHL Compliance Practices (N=286)

Practice item	Response	Intervention n (%)	Comparison n (%)	Total n (%)	χ^2	p	OR (95% CI)
E1. Distinguish civilians	Always/often	22 (15.4)	24 (16.8)	46 (16.1)	0.38	.944	0.98 [0.46, 2.10]
	Sometimes	75 (52.4)	73 (51.0)	148 (51.7)			
	Rarely/never	30 (21.0)	32 (22.4)	62 (21.7)			
	Not applicable	16 (11.2)	14 (9.8)	30 (10.5)			
E2. Shared IHL with peers	Yes	23 (16.1)	25 (17.5)	48 (16.8)	0.11	.742	0.91 [0.49, 1.68]
	No	120 (83.9)	118 (82.5)	238 (83.2)			
E3. Know reporting channel	Yes	42 (29.4)	39 (27.3)	81 (28.3)	0.17	.678	1.11 [0.66, 1.86]
	No	101 (70.6)	104 (72.7)	205 (71.7)			
E4. Report witnessed violation	Yes	21 (14.7)	20 (14.0)	41 (14.3)	0.11	.945	1.09 [0.55, 2.19]
	No	71 (49.7)	74 (51.7)	145 (50.7)			
	Unsure	51 (35.7)	49 (34.3)	100 (35.0)			
E5. Taken steps to protect civilians	Yes	38 (26.6)	36 (25.2)	74 (25.9)	0.08	.961	1.09 [0.62, 1.90]
	No	70 (49.0)	72 (50.3)	142 (49.7)			
	Not applicable	35 (24.5)	35 (24.5)	70 (24.5)			
E6. Participated in recent IHL briefing	Yes	20 (14.0)	22 (15.4)	42 (14.7)	0.11	.738	0.89 [0.46, 1.72]
	No	123 (86.0)	121 (84.6)	244 (85.3)			
E7. Followed correct detainee procedures	Yes	29 (20.3)	31 (21.7)	60 (21.0)	0.09	.954	0.90 [0.48, 1.70]
	No	54 (37.8)	52 (36.4)	106 (37.1)			
	Not applicable	60 (42.0)	60 (42.0)	120 (42.0)			
E8. Refuse unlawful order	Yes	15 (10.5)	17 (11.9)	32 (11.2)	0.28	.869	0.90 [0.42, 1.92]
	No	85 (59.4)	87 (60.8)	172 (60.1)			
	Unsure	43 (30.1)	39 (27.3)	82 (28.7)			

- *Note. Percentages are within study arm. The χ^2 and OR results apply to the complete response distribution for each practice item and are shown on the first row of each item. Source: thesis, Table 47.*

The baseline composite compliance-practice score was 18.85% (SD=12.70), with no significant between-arm difference (t(284)= -0.425, p=.671; 95% CI: -3.66 to 2.26; d= -0.06). The score range was 0 -62.5% in the intervention group and 0 -75.0% in the comparison group.

Table 8 Baseline Composite Self-Reported Compliance-Practice Score

Compliance metric	Intervention n=143	Comparison n=143	Total N=286	t (284)	p	95% CI	Cohen's d
Mean (SD), %	18.50 (12.30)	19.20 (13.10)	18.85 (12.70)	-0.425	.671	[-3.66, 2.26]	-0.06
Minimum score	0.00	0.00	0.00	-	-	-	-
Maximum score	62.50	75.00	75.00	-	-	-	-

- *Note. Source: Thesis, Table 8.*

➢ *Co-Design Process and Final Training Model*

A total of ninety-one stakeholders participated in the co-design process. The highest number of participants were weapon bearers (n=48) followed by community members (n=14), humanitarian practitioners (n=12), security stakeholders (n=9) and IHL/legal experts (n=8). The tool was designed using four participatory design workshops, eight focus groups, key-informant interviews, Delphi rounds, expert technical review and piloting.

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Table 9 Stakeholder Participation in Co-Design and Validation (N=91)

Stakeholder category	n	Composition described in thesis	Engagement mode	Contribution phase
IHL/legal experts	8	ICRC (3), UN OCHA (2), independent academics (3)	Delphi rounds; technical review	Validation
Humanitarian practitioners	12	INGOs (7), NNGOs (4), UN agencies (1)	FGDs; design workshops; pilot feedback	Needs assessment, design, validation
Security stakeholders	9	FARDC commanders (4), PNC officers (3), MONUSCO DDRRR (2)	KIIs; design workshops	Needs assessment and design
Weapon bearers/end-users	48	FARDC rank-and-file (28), PNC (12), former armed-group members in DDR (8)	FGDs; pilot testing; feedback	Needs assessment, design, pilot
Community representatives	14	Traditional leaders (6), women's groups (4), youth representatives (4)	FGDs; community validation	Needs assessment and contextual review
Total	91	-	-	-

- *Note. The stakeholder table represents co-design participation and is distinct from the 286-person quantitative evaluation sample. Source: thesis, Table 9.*

Four major themes emerged from the focus groups. These findings explain why the intervention was adapted away from a predominantly lecture-based model. Difficulty distinguishing civilians from combatants was raised in six of eight FGDs; operational pressure overriding humanitarian considerations in five; and limited understanding of command responsibility in four. For future training design, all eight FGDs supported locally relevant case studies and seven supported scenario-based simulations. Leadership commitment was raised in six FGDs, while fear of reporting violations was raised in four.

Table 10 Themes, Subthemes, Stakeholder Groups and Frequency Across Eight Focus Group Discussions

Theme	Subtheme	Stakeholder groups represented	Frequency
1. Operational challenges applying IHL	Difficulty distinguishing civilians and combatants during operations	FARDC rank-and-file; former armed-group members; PNC	6/8
	Operational pressure overrides humanitarian considerations	FARDC rank-and-file; former armed-group members	5/8
	Limited understanding of command responsibility	FARDC commanders; PNC	4/8
	Inconsistent interpretation of humanitarian principles across units	FARDC commanders	2/8
2. Factors influencing learning and training effectiveness	Preference for practical scenarios over lectures	FARDC rank-and-file; former armed-group members	7/8
	Language and literacy barriers	FARDC rank-and-file; PNC	5/8
	Frequent deployments interrupt training	FARDC commanders; PNC	4/8
	Previous training too theoretical / low operational relevance	Former armed-group members; humanitarian practitioners	3/8
3. Characteristics of acceptable co-designed training	Locally relevant case studies	All stakeholder groups	8/8
	Scenario-based simulations	All stakeholder groups	7/8
	Small-group discussions	FARDC rank-and-file; community representatives	6/8
	Periodic refresher sessions	FARDC commanders; humanitarian practitioners	5/8
	Female facilitators for SGBV sessions	Women's groups; humanitarian practitioners	3/8
4. Organizational and community factors	Leadership commitment for sustained compliance	FARDC commanders; humanitarian practitioners	6/8
	Respectful engagement between weapon bearers and communities	Community representatives; religious leaders	5/8
	Fear of reporting violations	Former armed-group members; women's groups	4/8

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- *Note. Frequency denotes the number of FGDs (out of eight) in which the subtheme was reported; it is not the number of individual participants endorsing it. Source: thesis, Table 10.*

Selected participant accounts illustrate how operational ambiguity, language barriers, training preferences, leadership reinforcement, and community accountability informed the model. The excerpts are reproduced from the thesis's qualitative results and are presented as explanatory evidence alongside the FGD frequency summary in Table 10.

Table 11 Illustrative Qualitative Evidence Informing the Co-Designed Training Model

Theme	Subtheme	Participant category	Illustrative quotation
Operational challenges	Difficulty distinguishing civilians from combatants	FARDC rank-and-file soldier, FGD 3, Goma	"Sometimes you arrive in a village after receiving information that armed men are hiding there. When you get there, everyone looks like an ordinary villager. It is difficult to know who is carrying a weapon and who is not. We know civilians should be protected, but in those moments the decision is not easy."
Training barriers	Language and literacy	FARDC commander, FGD 7, Goma	"Most of our soldiers are comfortable speaking Kiswahili. When the training is only in French and uses legal words that people have never heard before, many just keep quiet because they do not want to appear as if they have not understood."
Training preferences	Locally relevant case studies	FARDC rank-and-file soldier, FGD 3, Goma	"When the examples are about places we know, people pay more attention because they can imagine the situation. It becomes easier to discuss what should be done."
Training preferences	Gender-sensitive facilitation for SGBV	Women's group representative, FGD 8, Bukavu	"Some topics, especially sexual violence, are easier to discuss when women are part of the training team. People ask more questions and the discussion becomes more open."
Institutional reinforcement	Leadership commitment after training	FARDC commander, FGD 7, Goma	"After training, people return to their units. If commanders continue reminding them about these rules during operations, they are more likely to remember and apply them. If nobody talks about it again, people forget."
Community accountability	Regular dialogue with communities	Community representative, FGD 8, Bukavu	"When soldiers and community leaders meet regularly, people become more comfortable raising concerns. Small problems can be discussed before they become bigger problems."
Accountability and reporting	Fear of retaliation	Former armed-group member, DDR participant, FGD 6, Bunia	"People know they should report serious problems, but many worry about what might happen afterwards."

- *Note. Selected excerpts are reproduced from the thesis qualitative quotation tables (Tables 11 -14); participant categories, FGD identifiers and locations are reported as presented in the source. Quotations are illustrative accounts and are not independent verification of specific incidents.*

Table 12 Co-Designed IHL and Humanitarian-Principles Training Curriculum Reported in Chapter Four

Module	Learning objectives	Hours	Delivery methods	Contextual adaptation
1. Introduction to IHL and laws of war	Define IHL; distinguish IHL from human-rights law; identify applicable treaties	4	Interactive lecture; case studies; visual aids	Eastern DRC case studies; French and Kiswahili delivery
2. Protection of civilians	Apply distinction; identify protected persons; recognize prohibited attacks on civilian objects	6	Scenario simulation; role-play; map exercises	Village-level scenarios; settlement realities; customary-law concepts
3. Prevention of sexual and gender-based violence	Define conflict-related SGBV; identify command duty to prevent; apply reporting protocols	4	Facilitated discussion; testimonial videos; peer education	Culturally sensitive materials; male/female co-facilitators; community elder endorsement

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4. Humanitarian access and aid-worker protection	Explain obligation to allow humanitarian access; identify protected emblems; apply facilitation protocols	3	Practitioner panel; Q&A; emblem-recognition exercise	ICRC, WFP and local NGO contributions; coordination simulations
5. Command responsibility and accountability	Articulate commander's duty to prevent violations; describe reporting chains; identify disciplinary consequences	4	Command-level workshops; chain-of-command mapping; legal briefings	FARDC/PNC disciplinary-code integration; JAG involvement
6. Treatment of detainees and prohibition of torture	Apply humane-treatment standards; identify prohibited interrogation methods; explain ICRC access rights	3	SOP review; video demonstrations; legal case analysis	DRC detention-facility scenarios; monitoring orientation
7. Child protection in armed conflict	Identify prohibited recruitment; apply age verification; describe DDR pathways	3	Interactive drama; comic-book materials; anonymized testimonies	Child-protection committee involvement; specialist co-delivery
8. Humanitarian principles in practice	Apply neutrality, impartiality and independence; distinguish armed actors from humanitarian actors	2	Simulation; ethical-dilemma discussion; action planning	Eastern DRC resource-conflict scenarios; traditional-authority mediation
Capstone: field-application exercise	Integrate modules in a simulated operational setting; demonstrate lawful decisions under pressure	6	Controlled field simulation; after-action review; peer assessment	Controlled terrain; community actors/observers; joint civilian-military review

Table 13 Contextual Adaptations Incorporated in the Co-Designed Training Model

Adaptation category	**Conventional approach described in thesis**	**Eastern DRC adaptation**	**Rationale / stakeholder source**
Language	French or English only	French, Kiswahili and selected Kinyarwanda modules	Low literacy; Kiswahili widely used; weapon-bearer and community input
Case-study content	Historical examples (e.g., WWII/Balkans)	Contemporary Eastern DRC anonymized incidents and scenarios	Operational relevance and recognition; security stakeholders and humanitarian practitioners
Facilitator composition	Military legal officers or external academics only	Mixed team: IHL expert, military legal adviser, community elder and female facilitator for SGBV content	Credibility, gender-sensitive discussion and operational authenticity
Visual materials	Legal texts and treaty posters	Local comic books, pictorial flip charts and audio dramas	Literacy barriers and preference for visual/oral learning
Training venue	Classroom or military base	Rotating unit facilities, community centres, humanitarian hubs; mobile options for remote areas	Operational access and community trust
Duration/scheduling	Intensive 1 -3-day blocks	Modular five-day intensive or ten half-day sessions adapted to deployment cycles	Operational tempo and rotation duties
Assessment method	Written examination only	Practical simulation, oral assessment, peer evaluation and pocket-card verification	Emphasis on behavioural application and peer accountability
Follow-up mechanism	None or certificate only	Three-month refresher, SMS reminders, commander checklists and community feedback loops	Knowledge decay, high turnover and organizational reinforcement

- *Note. The duration/scheduling adaptation in Table 16 is a proposed flexible format and should not be treated as proof of the delivered dose. Source: thesis, Table 16.*

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➢ *Effectiveness of the Co-Designed Training Intervention*

The item level analyses showed significant positive differences between the study arms on all 17 statements. Differences ranged from +35.7 to +53.1 percentage points. All item level results were significant (p<.001). The greatest improvements were seen on questions about the independence of IHL (+53.1), armed actors should not decide who receive humanitarian aid (+51.0) and there should be no unnecessary harm to civilians (+49.6).

Table 14 Difference-in-Differences Analysis of Item-Level IHL and Humanitarian-Principles Knowledge

Knowledge item	Comparison baseline %	Comparison endline %	Intervention baseline %	Intervention endline %	DiD (pp)	OR (95% CI)	p
C3. Distinguish civilians vs combatants	40.6	42.6	43.4	85.3	+39.9	6.5 [3.8, 11.2]	<.001
C4. Civilian places should not be attacked	43.4	45.5	45.5	87.4	+39.8	7.1 [4.0, 12.5]	<.001
C5. Excessive civilian harm prohibited	26.6	28.0	24.5	75.5	+49.6	8.2 [4.8, 14.1]	<.001
C6. Precautions to minimize harm	34.3	36.4	36.4	78.3	+39.8	6.8 [4.1, 11.6]	<.001
C7. Health facilities protected	53.1	55.2	54.5	92.3	+35.7	9.4 [5.1, 17.5]	<.001
C8. Schools receive no special protection (False)	38.5	39.9	40.6	81.8	+39.8	6.3 [3.7, 10.8]	<.001
C9. Captured fighters may be tortured (False)	31.5	33.6	29.4	72.0	+40.5	5.8 [3.3, 10.1]	<.001
C10. Humanitarian workers protected	45.5	48.3	47.6	89.5	+39.1	7.8 [4.4, 13.9]	<.001
C11. Agreed rules of armed conflict exist	54.5	56.6	56.6	94.4	+35.7	10.2 [5.3, 19.6]	<.001
C12. Do not obey unlawful attack order	21.7	23.1	19.6	65.7	+44.7	6.0 [3.5, 10.3]	<.001
C13. Command responsibility	36.4	38.5	33.6	76.9	+41.2	6.2 [3.6, 10.7]	<.001
C14. Humanity/address suffering	44.1	46.2	45.5	88.1	+40.5	7.4 [4.2, 13.1]	<.001
C15. Humanitarian aid should not favour one side	29.4	31.5	31.5	74.8	+41.2	6.1 [3.5, 10.5]	<.001
C16. Neutrality/do not take sides	41.3	42.7	38.5	82.5	+42.6	7.0 [4.1, 12.2]	<.001
C17. Impartiality/aid based on need	35.7	37.8	33.6	79.0	+43.3	6.9 [4.0, 11.9]	<.001
C18. Independence/autonomous action	23.8	26.6	24.5	80.4	+53.1	10.8 [6.2, 18.9]	<.001
C19. Armed actors should not determine aid recipients	14.0	16.1	15.4	68.5	+51.0	11.2 [6.0, 20.9]	<.001

- *Note. The DiD estimate is the net percentage-point change. The thesis labels the final column as odds ratios but does not consistently specify whether these are adjusted. All p values are reported as <.001; thesis reports retention of statistical significance at Bonferroni α=.003. Source: thesis, Table 17.*

The experimental condition showed a large increase in the mean score of composite knowledge (+8.60; [6.20,14.80]), whereas the control condition only showed a small increase in the mean score (+0.18; [6.27,6.45]). This resulted in a DiD estimate of +8.42 (95%CI: 7.15 -9.69; p<.001; d=1.85).

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Table 15 Difference-in-Differences Analysis of Composite IHL Knowledge Scores (0 -17)

Metric	Comparison baseline	Comparison endline	Comparison change	Intervention baseline	Intervention endline	Intervention change	DiD (95% CI)	p	d
Mean score	6.27	6.45	+0.18	6.20	14.80	+8.60	+8.42 [7.15, 9.69]	<.001	1.85
Minimum score	2	3	+1	1	11	+10	-	-	-
Maximum score	12	13	+1	13	17	+4	-	-	-

- *Note. Source: thesis, Table 18. The outcome is an assessed knowledge score, not direct observation of battlefield decisions.*

➢ *Attitude Outcomes*

The mean attitude score in the intervention group increased by 11.70 points, from 28.10 to 39.80, compared to an increase of 0.80 points (28.20 to 29.00) in the comparison group. This resulted in a DiD estimate of +10.90 points (95% CI: 8.70-13.10) (p<.001; d=0.93). Ten of the twelve attitude items saw significant improvements in attitude. The greatest improvements were seen in attitudes towards prioritising civilians over tactical objectives (1.15) and thinking everyone deserves help (1.10). There was no significant improvement in willingness to disobey an illegal order (p=.064) or belief that commanders care about obeying orders (p=.118).

Table 16 Difference-in-Differences Analysis of Item-Level Attitudes Toward IHL and Humanitarian Principles (1 -5 Scale)

Attitude item	Comparison baseline	Comparison endline	Intervention baseline	Intervention endline	DiD	95% CI	p	d
D1. Important to respect laws of war	3.20	3.30	3.10	3.95	+0.75	[0.42, 1.08]	<.001	0.70
D2. Civilians before tactical goal	2.40	2.50	2.30	3.55	+1.15	[0.82, 1.48]	<.001	0.93
D3. Trust NGOs to act fairly	2.10	2.20	2.10	2.95	+0.75	[0.38, 1.12]	<.001	0.66
D4. Report violations without fear	1.90	2.05	1.80	2.65	+0.70	[0.29, 1.11]	.001	0.61
D5. Everyone deserves aid	2.60	2.70	2.50	3.70	+1.10	[0.79, 1.41]	<.001	0.89
D6. IHL makes unit more effective	2.20	2.35	2.30	3.40	+0.95	[0.61, 1.29]	<.001	0.82
D7. Personal responsibility to know rules	2.70	2.80	2.80	3.60	+0.70	[0.36, 1.04]	<.001	0.63
D8. Encourage peers to follow IHL	2.50	2.60	2.40	3.45	+0.95	[0.60, 1.30]	<.001	0.80
D9. NGOs operate independently	2.10	2.20	2.20	2.85	+0.55	[0.18, 0.92]	.004	0.49
D10. Confident in recognizing violations	2.30	2.40	2.40	3.30	+0.80	[0.48, 1.12]	<.001	0.72
D11. Refuse unlawful order	1.70	1.80	1.60	2.35	+0.65	[-0.04, 1.34]	.064	0.38
D12. Commanders take compliance seriously	2.50	2.60	2.60	3.05	+0.35	[-0.10, 0.80]	.118	0.24

- *Note. Means are on a five-point scale. DiD values, confidence intervals, p values and Cohen's d are reported in thesis Table 19. Two items were not statistically significant.*

There was a favourable shift in the distribution of responses. Negative/Resistant attitudes decreased by a total of 29.9% (95% CI: -37.8--22.0, p<.001, OR=0.26), whereas positive/Receptive attitudes rose by 24.4% (95% CI: 18.1-30.7, p<.001, OR=8.56).

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Table 17 Difference-in-Differences Analysis of Composite Attitude Scores and Categories

Attitude metric/category	Comparison baseline	Comparison endline	Intervention baseline	Intervention endline	DiD / net difference	95% CI	p	Effect estimate
Composite mean (0 -60)	28.20	29.00	28.10	39.80	+10.90 points	[8.70, 13.10]	<.001	d=0.93
Negative/resistant (12 -28)	54.5%	52.4%	56.6%	24.5%	-29.9 pp	[-37.8, -22.0]	<.001	OR=0.26
Neutral/ambivalent (29 -43)	42.0%	43.4%	39.9%	48.3%	+7.0 pp	[1.2, 12.8]	.019	OR=1.41
Positive/receptive (44 -60)	3.5%	4.2%	3.5%	27.2%	+24.4 pp	[18.1, 30.7]	<.001	OR=8.56

- *Note. pp=percentage points. Categories use thesis-defined cut-offs. Source: thesis, Table 4.20. The thesis abstract reports a different attitude DiD (+18.40); the value shown here is taken from the detailed results table and must be reconciled against the analysis dataset.*

➢ *Self-Reported Compliance-Practice Outcomes*

Seven of the eight self-reported compliance behaviours were significantly positively associated with DiD. The largest proportional change was in attending a recent IHL briefing (41.9pp, OR=4.82, 95%CI 2.81-8.29, p<.001). There was also a significant increase in intentional efforts to differentiate civilians (29.4pp), knowledge of internal reporting procedures (27.2pp), peer dissemination (24.5pp), actions to protect civilians (21.0pp), willingness to report violations observed (19.8pp) and correct procedures for detainees (18.9pp). However, there was no significant increase in willingness to refuse an unlawful order (12.6pp, p=.058).

Table 18 Difference-in-Differences Analysis of Self-Reported Compliance Practices

Compliance practice (yes/always)	Comparison baseline	Comparison endline	Intervention baseline	Intervention endline	DiD (pp)	OR (95% CI)	p
E1. Deliberate effort to distinguish civilians	16.8%	18.2%	15.4%	46.2%	+29.4	3.41 [2.02, 5.77]	<.001
E2. Shared IHL information with peers	17.5%	18.9%	16.1%	42.0%	+24.5	2.95 [1.78, 4.89]	<.001
E3. Know correct internal reporting channel	27.3%	28.7%	29.4%	58.0%	+27.2	3.05 [1.89, 4.93]	<.001
E4. Would report witnessed violation	14.0%	16.8%	14.7%	35.7%	+19.8	2.41 [1.39, 4.18]	.002
E5. Took steps to protect civilians	25.2%	27.3%	26.6%	49.7%	+21.0	2.67 [1.63, 4.36]	<.001
E6. Participated in recent IHL briefing	15.4%	16.8%	14.0%	54.5%	+41.9	4.82 [2.81, 8.29]	<.001
E7. Followed correct detainee procedures	21.7%	23.1%	20.3%	40.6%	+18.9	2.32 [1.39, 3.86]	.001
E8. Would refuse an order violating IHL	11.9%	13.3%	10.5%	24.5%	+12.6	1.76 [0.98, 3.17]	.058

- *Note. Values are percentages answering yes/always, as reported in thesis Table 4.21. ORs and confidence intervals are reproduced from the thesis; the table does not consistently specify adjustment status. The unlawful-order refusal item was not statistically significant at p<.05.*

Compliance practice scores increased by 18.5% to 46.4% in the intervention group and 19.2% to 20.3% in the comparison group, resulting in an overall improvement of 26.8% (95% CI 21.7-31.9; p<.001; d=0.88).

Table 19 Difference-in-Differences Analysis of Composite Self-Reported Compliance-Practice Score

Metric	Comparison baseline	Comparison endline	Intervention baseline	Intervention endline	DiD (95% CI)	p	d
Mean adjusted compliance score (%)	19.2	20.3	18.5	46.4	+26.8 [21.7, 31.9]	<.001	0.88
Minimum score (%)	0.0	0.0	0.0	12.5	-	-	-
Maximum score (%)	75.0	75.0	62.5	87.5	-	-	-

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- *Note. Source: thesis, Table 22. The thesis abstract reports a different compliance DiD (+55.10 percentage points); the detailed results table reports +26.8 percentage points and is used here pending verification from the analysis dataset.*

➢ *Barriers to Compliance with IHL and Humanitarian Principles*

The most common individual obstacles preventing effective reporting were: a lack of training in IHL (69.9%), a lack of understanding of IHL principles (62.9%), poor literacy levels (55.2%) and language barriers due to materials being only in French (51.0%). Fear of sanctions (48.3%) and economic pressures/pressure to survive (45.8%) were also seen as obstacles to reporting violations. Peer pressure/unit loyalties (43.7%) were also an obstacle to reporting. There was no significant difference between study arms for any obstacles at baseline.

Table 20 Individual-Level Barriers to IHL Compliance at Baseline (N=286)

Barrier	Intervention n (%)	Comparison n (%)	Total n (%)	χ^2	p	OR (95% CI)
Lack of training on IHL	102 (71.3)	98 (68.5)	200 (69.9)	.26	.610	1.14 [0.69, 1.88]
Lack of knowledge of IHL rules	89 (62.2)	91 (63.6)	180 (62.9)	.06	.808	0.94 [0.59, 1.51]
Low literacy limiting comprehension	76 (53.1)	82 (57.3)	158 (55.2)	.50	.479	0.85 [0.53, 1.36]
Language barrier (French-only materials)	71 (49.7)	75 (52.4)	146 (51.0)	.21	.647	0.90 [0.56, 1.43]
Fear of punishment for reporting violations	67 (46.9)	71 (49.7)	138 (48.3)	.24	.626	0.89 [0.56, 1.42]
Personal financial hardship/survival pressure	63 (44.1)	68 (47.6)	131 (45.8)	.35	.554	0.87 [0.54, 1.39]
Loyalty to unit/peer pressure	61 (42.7)	64 (44.8)	125 (43.7)	.12	.729	0.92 [0.57, 1.48]
Cynicism about IHL enforcement	55 (38.5)	59 (41.3)	114 (39.9)	.24	.626	0.89 [0.55, 1.44]
Moral disengagement/normalization of violence	54 (37.8)	58 (40.6)	112 (39.2)	.24	.626	0.89 [0.55, 1.44]
Perceived irrelevance of IHL to local conflict	48 (33.6)	52 (36.4)	100 (35.0)	.24	.626	0.89 [0.54, 1.45]

- *Note. Source: thesis, Table 23. All baseline comparisons were reported as non-significant.*

Institutional barriers were very common. The most common barriers respondents identified were a lack of refreshers (83.9%) and lack of inclusion in initial training (81.5%). Other common barriers included poor implementation at command level (68.2%), no disciplinary measures (66.8%) and lack of legal advisors (62.6%). These barriers were described as being structural. One FARDC commander said: "When there is no discipline for breaches then it isn't because they don't know the law but because commanders do not want to discipline their own staff". One PNC officer said: "We have no legal support so we have the law on paper but not in practice.

Table 21 Institutional and Organizational Barriers to IHL Compliance at Baseline (N=286)

Barrier	Intervention n (%)	Comparison n (%)	Total n (%)	χ^2	p	OR (95% CI)
No regular refresher training on IHL	121 (84.6)	119 (83.2)	240 (83.9)	.10	.752	1.11 [0.61, 2.02]
Absence of IHL in pre-service training	118 (82.5)	115 (80.4)	233 (81.5)	.23	.632	1.14 [0.65, 2.01]
Weak command enforcement of IHL rules	96 (67.1)	99 (69.2)	195 (68.2)	.14	.708	0.91 [0.56, 1.48]
Absence of disciplinary consequences	94 (65.7)	97 (67.8)	191 (66.8)	.14	.708	0.91 [0.56, 1.48]
Lack of military legal advisers (JAG)	88 (61.5)	91 (63.6)	179 (62.6)	.14	.708	0.91 [0.56, 1.48]
Competing operational priorities override IHL	78 (54.5)	81 (56.6)	159 (55.6)	.12	.729	0.92 [0.57, 1.48]

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Resource constraints (transport/materials/venue)	72 (50.3)	76 (53.1)	148 (51.7)	.21	.647	0.90 [0.56, 1.43]
High personnel turnover/rotation	65 (45.5)	69 (48.3)	134 (46.9)	.21	.647	0.90 [0.56, 1.43]
Political interference in military justice	58 (40.6)	62 (43.4)	120 (42.0)	.24	.626	0.89 [0.55, 1.44]
Corruption undermining accountability	52 (36.4)	55 (38.5)	107 (37.4)	.12	.729	0.92 [0.57, 1.48]

- *Note. Source: thesis, Table 24. All baseline comparisons were reported as non-significant.*

Environmental and community challenges were perceived by respondents to include: proliferation of armed actors making it difficult to identify civilians (69.6%); collaboration between civilians and armed actors (61.5%); lack of community confidence in security forces (56.3%); insecurity restricting humanitarian access (53.8%); competition for resources over land and minerals (50.7%); and a lack of safe reporting mechanisms for civilians (49.3%). Accounts indicated that uncertainty of irregular conflict and lack of confidence led to difficulty in identifying, sharing information and holding accountable.

Table 22 Environmental and Community-Level Barriers to IHL Compliance at Baseline (N=286)

Barrier	Intervention n (%)	Comparison n (%)	Total n (%)	χ^2	p	OR (95% CI)
Proliferation of armed groups blurring civilian status	98 (68.5)	101 (70.6)	199 (69.6)	.15	.699	0.90 [0.55, 1.48]
Civilian collaboration with armed groups	87 (60.8)	89 (62.2)	176 (61.5)	.06	.808	0.94 [0.59, 1.51]
Lack of community trust in security forces	79 (55.2)	82 (57.3)	161 (56.3)	.12	.729	0.92 [0.57, 1.48]
Insecurity limiting humanitarian access	76 (53.1)	78 (54.5)	154 (53.8)	.05	.823	0.95 [0.59, 1.52]
Resource competition (land/minerals)	71 (49.7)	74 (51.7)	145 (50.7)	.12	.729	0.92 [0.57, 1.48]
Absence of safe reporting channels for civilians	69 (48.3)	72 (50.3)	141 (49.3)	.10	.752	0.92 [0.58, 1.47]
Cross-border movement of armed actors	64 (44.8)	67 (46.9)	131 (45.8)	.12	.729	0.92 [0.57, 1.48]
Impunity for violations by non-state armed groups	62 (43.4)	65 (45.5)	127 (44.4)	.12	.729	0.92 [0.57, 1.48]
Cultural norms condoning violence against women	58 (40.6)	61 (42.7)	119 (41.6)	.12	.729	0.92 [0.57, 1.48]
Weak state presence in remote areas	55 (38.5)	58 (40.6)	113 (39.5)	.12	.729	0.92 [0.57, 1.48]

- *Note. Source: thesis, Table 25. All baseline comparisons were reported as non-significant.*

IV. DISCUSSION

➢ *Principal Findings and Contribution*

The implementation of a co-designed IHL and principles training model corresponded to significant improvements in knowledge, attitudes and self-reported behaviours amongst the Government-aligned weapon bearers included in this study. This paper made three key contributions. Firstly, a thorough profile of baseline knowledge was provided, identifying limited knowledge of IHL and adherence behaviours within a highly combat deployed population. Secondly, the process undertaken to ensure end-users and stakeholders (humanitarian, legal, security and community sectors) could co-design a specific training curriculum based on these identified knowledge gaps. Finally, quasi-experimental results were provided which demonstrated improvements in the assessed KAP outcomes. However, certain areas such as refusing unlawful orders and confidence in commander commitment were unchanged.

This aligns with the overall theory that IHL education will be more impactful in influencing behaviour if it is integrated within the systems, leadership and processes of armed actors. Integration can be described as an ongoing process through doctrine, training, equipment and sanctions. [3] The ICRC's report on military training in 2024 also noted that training and socialisation can influence attitudes. However, it was acknowledged that there are conflicting values between force protection and military advantage that can impact restraint. [5] This study has demonstrated that training can be an important part of promoting adherence but should not be used to replace systems of control.

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➢ *Baseline Deficits and the Implications of Prior Combat Experience*

The results from the baseline data indicate that those with previous combat deployment should not be assumed to have any expertise in humanitarian issues. As more than four fifths of the sample had previous combat deployment, only a small amount (16.4%) had received any formal IHL training in the past. The average score from the knowledge section was 6.23 out of 17. The low percentages of knowledge on how to report, recent IHL refreshers, willingness to report and refusal to obey unlawful orders indicate a clear lack of learning within the institution. It appears that whilst there may be increased tacit knowledge due to operational experience, there is no systematic increase in knowledge on distinguishing between lawful and unlawful targets, taking precautions, humane treatment, command responsibility and humanitarian principles.

The level of education and languages was an important factor when designing the intervention. As most respondents had primary education and nearly three quarters spoke Swahili as their main language, using complicated written resources in French would exclude many of those who would be expected to follow the rules. This was overcome by using a bi-lingual approach; visual and audio resources; verbal activities and scenarios based on local cases. DCAF guidance also stresses the importance of aligning delivery methods and training staff to the needs of military roles. It also highlights the importance of integrating IHL into doctrine and profession. [7]

➢ *Knowledge Gains and Contextualized Adult Learning*

The DiD estimate of +8.42 (17 point scale) indicates that there was a large increase in knowledge. Overall there was an improvement in understanding of the content of rules and principles during training. Improvements were notable in independence, allocation of humanitarian aid, prohibiting unacceptable harm to civilians and refusing unlawful orders. These topics appeared to be some of the weakest areas at baseline. This demonstrates how targeting specific misconceptions relevant to the situation can help individuals improve their knowledge.

These findings align with adult learning theory and collaborative design principles. As the trainees had extensive operational experience, providing relatable examples, practical discussions and respecting language and educational differences can improve engagement. These findings can also be interpreted using Social Cognitive Theory and the Theory of Planned Behaviour. Observational learning, self-efficacy, perceived social norms and perceived control can help explain why knowledge did not always lead to increased willingness to challenge unlawful orders [18,19]. However, it should not be assumed knowledge scores indicate long term retention. The endline was completed after a short period of time had passed. No retention has been shown beyond this point. In future implementations refreshers should be given and delayed testing should be included [5,7 -9].

➢ *Attitudes, Authority and Command Climate*

The attitude score showed significant improvements with 10 out of 12 items showing significance. Improvements to prioritise civilians, provide unbiased support, encourage peers, feel confident to identify violations and be willing to report all show increased adoption of humanitarian values. However, there were still two items which were not significant. These were willingness to disobey illegal orders which showed uncertainty (p=.064) and feeling commanders are serious about obedience (p=.118). This suggests that although attitudes may improve on an individual level, attitudes towards command behaviour and feeling safe to challenge illegal orders may not.

Recent literature shows that junior leaders and Non Commissioned Officers play an important role in ensuring IHL is internalised. They are responsible for embedding organisational values into practice and shaping attitudes to restraint. [6] Qualitative findings show that participants frequently mentioned commander commitment, reporting being protected and consequences for discipline as factors in ensuring they would be compliant in the long term. Therefore these should be explicitly targeted in a more mature training model. Commanders and Non Commissioned Officers should be involved in training, commanders' responsibilities to prevent and respond should be practised and an safe and trustworthy method of raising concerns should be implemented.

➢ *Self-Reported Compliance Practices and the Evidence Boundary*

There is some positive evidence provided by the improvement in composite practice score and the majority of behaviours (7/8). The increased engagement with briefings, sharing information within peers, understanding of internal reporting channels, civilian protection actions, willingness to report and reported detainee procedures indicates that training has increased individual self-reported practice. The non-significant finding on refusing unlawful orders again indicates that individual practice can be impacted by organisational and hierarchical factors.

Outcome: This data was self reported. The study did not independently monitor decision making under fire; we have no way of confirming whether they actually did what they said they would. We also did not audit the unit incident logs or measure how much less harm was done to civilians. Self reported data can cause issues with recollection bias, fear of exposure and social desirability. This means this data only shows us that there was an improvement in self reported practises but does not tell us that there was an improvement in verified practise.

➢ *Co-Design, Ownership and Operational Relevance*

This model has been successfully applied with 91 stakeholders. Weapon bearers were able to identify their learning requirements and preferences. Curriculum review was undertaken by humanitarian practitioners, security actors, community members and legal professionals. This is an example of a co-creation approach which seeks to ensure those intended to use the tool are involved in its creation.[9]

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The qualitative themes show the most useful adaptations were case studies that were locally focused, to address uncertainty around civilian status within communities that may not always have uniformed actors. Scenario based simulations were included to facilitate discussion around decision making under pressure. Bilingual and visual learning was included to address literacy and language barriers. Facilitators were women to address issues relating to SGBV and community involvement. Future success of the model will rely on retaining these aspects whilst ensuring they were accurate within the doctrine.

- *Barriers and the Need for System-Level Reinforcement*

The barriers highlighted show how compliance is a complex issue. At an individual level training is lacking and this is made worse by illiteracy, language barriers, peer pressure, fear of retribution and acceptance of violence. Training appears to be an issue at an institutional level with many individuals not receiving refresher training, there is no pre-service training, poor command enforcement, no repercussions for discipline and little legal advice available. On an environmental level there are many armed groups, lack of trust amongst civilians, security issues, disputed resources and poor reporting systems.

This strengthens the argument that training should be part of a comprehensive compliance system. The ICRC have developed an integrated approach which looks at doctrine, training, equipment, enforcement from commanders and consequences. [3] This study would therefore recommend regular training to be provided for the right roles, providing materials in the local language, regular briefings at unit level and scenario-based training. Enforcement from commanders, military legal advisors, safe reporting systems, supervision and structured community engagement. Feedback from communities should be carefully planned to ensure those making complaints and witnessing incidents do not face any retribution. Humanitarian organisations must also remain neutral, impartial, independent and safe.

- *Strengths and Limitations*

The study has many strengths, including a sample with a good balance of quantitative data, pre- and post-testing, a comparison group, high rates of participation, detailed baseline data, involvement of participants in design, technical review and mixed-methods analysis. The study looks at knowledge, attitudes, self-reported behaviour and barriers to implementation, giving greater insight into the impact of the training.

However, there are many limitations. Firstly, it was not randomised, and the intervention was very closely related to the province. This could mean that factors such as security conditions, leadership, presence and other events within specific provinces will affect the outcome. Additionally, although there was equivalence between the two groups in terms of baseline characteristics, this does not account for other confounding factors. Secondly, there is only one pre-intervention data point, meaning the parallel trends assumption cannot be tested. Thirdly, the data were self-reported. Fifthly, the quantitative analysis does not include adversarial non-state armed groups.

- *Implications for Policy, Practice and Research*

The findings suggest that IHL should become a part of standard introductory training, pre-deployment training, promotion, leadership and operational briefings. Commanders and NCOs should receive training on identifying, preventing, reporting and responding to breaches. There should also be clear consequences for failure to do so within institutions. Units should have access to military legal advisors who can advise on issues during operations in a language that can be understood.

Curriculum development should be inclusive of those being taught and relevant communities. Materials should be presented in a local language and in a manner that can be understood by those with low literacy levels. Scenario-based learning should be used. Gender sensitive facilitators should be used. Evaluation should be conducted using delayed testing, observation in the field (if safe and ethical), unit-level process measures and independent protection monitoring. Future research should be conducted using more than one baseline time point; more units within the intervention and control groups; clustering accounted for; adjustment models reported clearly; and longer-term follow-up. Where there is principled access, future studies should explore how engagement with non-state armed groups can be done impartially and safely.

V. CONCLUSION

This co-designed training intervention in IHL and humanitarian principles demonstrated marked improvements in the knowledge, attitude and reported behaviour of government-aligned weapon bearers in the eastern DRC. The training was developed using a participatory approach and was sensitive to local language and literacy levels, practicalities, gender and social contexts. As shown in the detailed tables, there was a significant increase in knowledge (+8.42 DiD), attitude (+10.90 DiD) and reported behaviour (+26.8%DiD). However, there was no significant change in the willingness to refuse illegal orders and barriers were still identified relating to command, legal advice, accountability and security. This demonstrates that the training intervention has potential as a useful part of a wider compliance approach when delivered in a context-sensitive manner. Conclusions should be limited to this sample only, and to observed/measured outcomes until further evidence on long-term and independently verified behaviour change becomes available.

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DECLARATIONS

- Ethical approval: The research sought approval from GLUSERC and the relevant DRC national ethics authority, together with military and administrative authorizations.
- Informed consent: The research administered obtained written or thumb-printed informed consent, separate consent for audio recording, and private recruitment away from command personnel.
- Funding: The author has declared no external funding source for this research.
- Conflict of interest: The author declares no conflict of interest
- Author contributions: Thierry Mugisho Byandi: Conceptualization, Methodology, Data acquisition, Writing -original draft. Prof. Leo Juma Ogallo, Dr Kennedy Indembukhani: Validation, review, and editing.
- Data availability: Data include sensitive information about weapon bearers in a conflict-affected setting. Any data-sharing statement must be consistent with participant consent, ethics approvals, confidentiality commitments and security considerations.

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