NCI Multilevel Intervention Training Institute (MLTI) Evaluation

Executive Summary

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Created by:

Dana Verhoeven, PhD, MS

Cancer Research Training Award Fellow
Health Systems and Interventions Research Branch
Healthcare Delivery Research Program
Division of Cancer Control and Population Sciences
National Cancer Institute

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Multilevel Intervention Training Institute (MLTI) Program Evaluation

Background of MLTI and Institute Training Goals

The National Cancer Institute (NCI) launched the Multilevel Intervention Training Institute (MLTI) in 2020 to build capacity and skills for researchers in the field of cancer care and to further multilevel intervention (MLI) research. The MLTI utilized distance learning sessions that covered relevant theory, its use in MLI research; study approaches and methods (quantitative, qualitative, and mixed methods); and additional topics central to the design, successful funding, and conduct of research on multilevel cancer care delivery interventions. MLTI participants had the opportunity to learn from leaders in multilevel intervention research, form new collaborations, and receive feedback on ideas for MLI NCI grant applications.

Overall, the Institute aims to:

1. Train healthcare and public health researchers in MLI research to advance the quality of multilevel research and grant applications.
2. Provide participants with a thorough grounding in conducting and reviewing MLI research with a specific focus on cancer care across the cancer control continuum.

MLTI Evaluation Overview and Aims

This report presents the results of a multicomponent evaluation of MLTI. The evaluation applied the Kirkpatrick Four Levels Training Evaluation Model and a mixed-methods evaluation strategy to assess achievements of the Institutes objectives. Thus, the aims of the evaluation are to:

1. Assess trainee learning of MLI research with a pre- and posttest evaluation.
2. Collect trainee feedback regarding the value of MLTI in terms of its utility and their overall reactions to the training.
3. Quantify the impact of MLTI by measuring trainees' intent to conduct and submit grant applications for MLI multilevel research

MLTI Course Overview and Learning Objectives

MLTI Course Schedule

MLTI consisted of 18 different modules or sessions. Course modules included lectures and small group discussions. Typically, the MLTI lecture sessions were offered every other week with small group meetings occurring in the week between lectures.

Small groups were organized by subject area, with trainees assigned to their respective small groups based on the content of their MLTI application proposals. Therefore, trainees with similar proposal topics were placed together. There were 6 total small groups. All small groups were comprised of a diverse set of academic backgrounds and investigator levels. Small group sessions were led by MLTI course faculty.

Table 1. Overview of MLTI course schedule and focal topics

Course Module	Module format	Module Title	Date
Module 1	Lecture	Introduction to Multilevel Intervention Research	5/6/20
Module 2	Lecture	Conceptual Aspects of Theory	5/21/20
Module 3	Small group	Small Work Group. Role and Use of Theory	5/28/20
Module 4	Lecture	Use and Application of Theory	6/4/20
Module 5	Small group	Small Work Group. Application of Theory	6/11/20
Module 6	Lecture	Study Design Part I. Quantitative	6/18/20
Module 7	Small group	Small Work Group. Part I. Quantitative Analytic Techniques	6/25/20
Module 8	Lecture	Study Design Part II. Quantitative	7/2/20
Module 9	Small group	Small Work Group. Part II. Quantitative Analytic Techniques	7/23/20
Module 10	Lecture	Study Design Part III. Qualitative	7/30/20
Module 11	Small group	Small Work Group. Parts I & II. Quantitative Analytic Techniques	8/6/20
Module 12	Lecture	Study Design Part III. Qualitative (cont.)	8/13/20
Module 13	Small group	Small Work Group. Part III. Qualitative Analytic Techniques	8/20/20
Module 14	Lecture	Measures and measurement	8/27/20
Module 15	Lecture	Combining Study Designs and Capstone Project	9/3/20
Module 16	Lecture	Economic Analysis, Sustainability, Spread	9/10/20
Module 17	Trainee Presentations	Capstone Presentation, virtual	9/17/20
Module 18	Trainee Presentations	Capstone Presentation, virtual	9/24/20

MLTI Learning Objectives and Competencies

Each MLTI lecture and small group module included a set of learning objectives or course competencies. To streamline the evaluation domains, the individual lecture and small group competencies were categorized into five overarching competency domains:

- ▪ MLTI Competency Domains
    - i. *Familiarity and knowledge of common and relevant multilevel theories*
    - ii. *Applying multilevel theory to research and research plans*
    - iii. *Multilevel intervention design and research methods*
    - iv. *Multilevel qualitative analyses*
   - v. *Multilevel quantitative analyses*

The competency domains and associated learning objectives were used to define evaluation criteria and develop evaluation questions.

Training Evaluation Approach and Theory

The MLTI evaluation is based on Kirkpatrick's Four Levels of training evaluation, a framework that has been utilized since its origin in 1954. [1,2] The approach evaluates trainees across four levels of assessment including: 1) trainee *reactions*, 2) trainee *learning*, 3) trainee *behavior*, and 4) organizational *results* stemming from the trainee behavior.

The Kirkpatrick Four Levels framework offers a planning process for building effective training programs as well as an evaluation process, as shown in Figure 1. Specifically, the implementation of the Kirkpatrick framework is initiated at the onset of training development by defining the planning processes for building an effective training program. These constructs are then applied to evaluate the success of the training program.

Figure 1. The Kirkpatrick Four Levels Model: From Planning to Evaluation
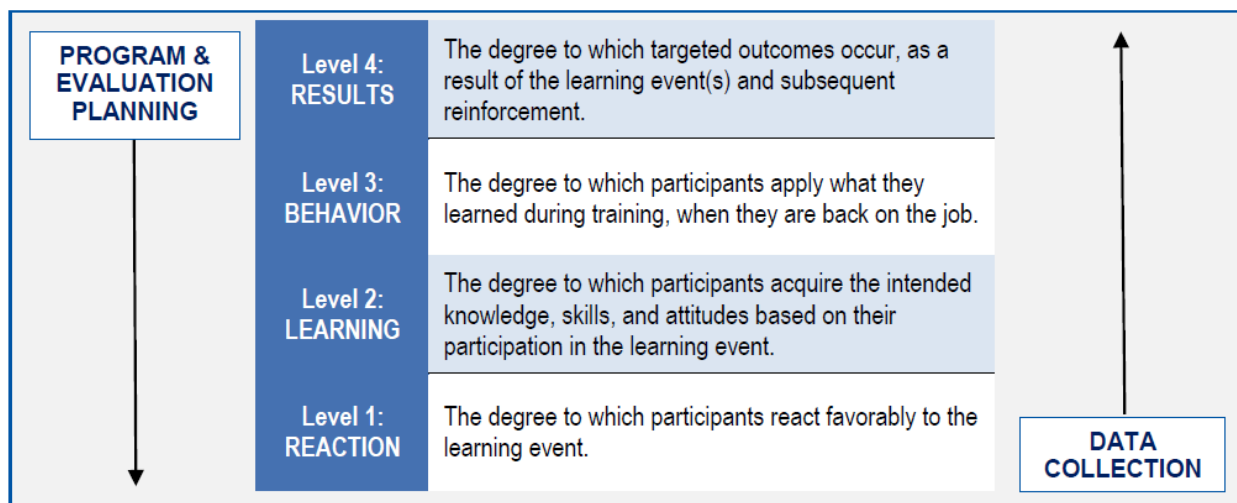
Kirkpatrick (1993, p. 26) explained that "trainers must begin with desired results and then determine what behavior is needed to accomplish them. Trainers must determine what attitudes, knowledge, and skills that are necessary to bring about the desired behavior(s). The final challenge is to present the training program in a way that enables trainees to learn what they need to know and also to react favorably to the program." Therefore, planning and training design begins with Level 4 and moves down through the levels (i.e., Level 4 to Level 1), while data collection for training evaluation begins at Level 1 and moves upward (i.e., Level 1 to Level 4).

To facilitate the transfer of newly trained knowledge, skills, and abilities to the real world, the Kirkpatrick Four Levels of Analysis build upon one another sequentially. As shown in Figure 2, the trainees' general *Reaction* (Level 1) to the training in terms of trainees' perceptions of its overall utility and quality, and *Learning* (Level 2) predict whether or not the training influenced trainee *Behaviors* (Level 3) and, ultimately, *Results* (Level 4).

Figure 2. The New World Kirkpatrick Model
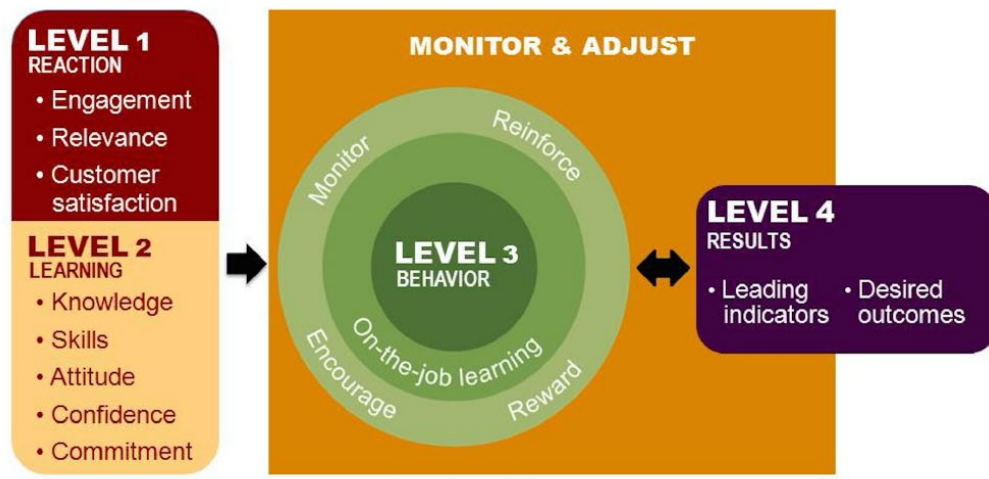
MLTI Trainee Demographics and Participation

MLTI included participants from varying academic backgrounds and investigator levels. This section provides an overview of the MLTI trainee population and summarizes overall course participation.

Trainee Demographics

Table 2 provides an overview of the trainee characteristics for the inaugural group of 47 trainees in 2020. Table 3 describes the small groups, their topics, and number of trainees per group.

Table 2. MLTI Trainee Demographics

	N
Participation	
# completed pre-test	48
# completed post-test	40
# completed both pre- and post-test	35
Investigator level	
Junior	11
Mid-level	30
Senior	6
Academic background	
PhD	34
MD	13
*Total number of trainees**	47

*50 participants were originally selected to participate; 3 dropped out.

Table 3. Small Group Assignments

	N
Group 1: Screening	7
Group 2: Screening	8
Group 3: Screening and HPV Vaccination	7
Group 4: Survivorship and Physical Activity	7
Group 5: Survivorship and Palliative Care	9
Group 6: Survivorship and Smoking Cessation	9
TOTAL	47

Training participation

Overall, training participation remained stable throughout the MLTI lectures with attendance declining only slightly over time (Figure 3). This was notable during the summer (Module 6 - Module 10). Small group attendance followed a similar pattern (Figure 4)

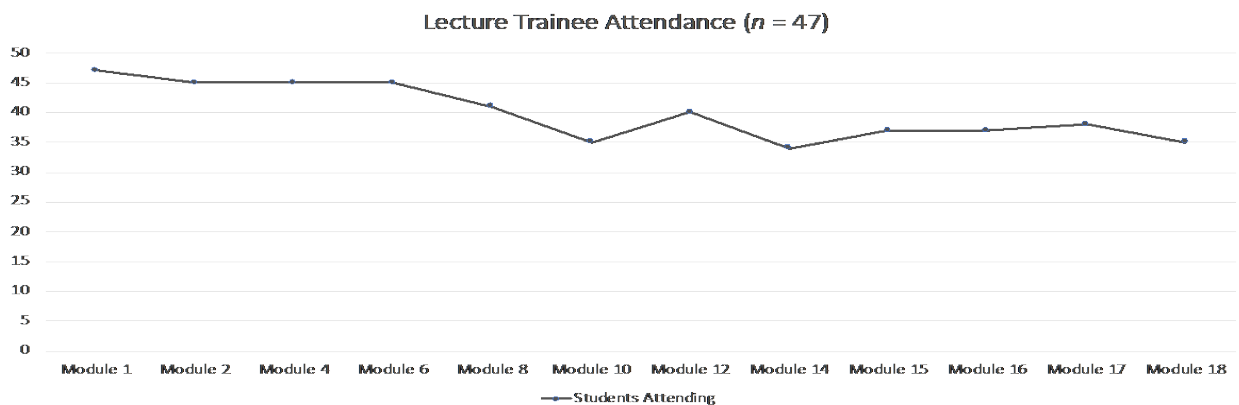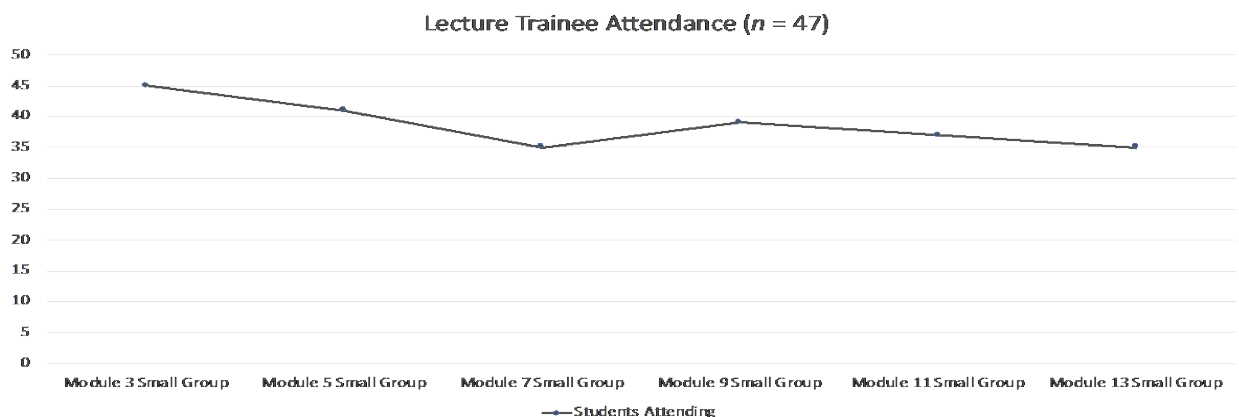**Figure3.** Overall trainee attendance in course lectures (*n* = 47)

Lecture Trainee Attendance (*n* = 47)

Figure 4. Overall trainee attendance in small groups (*n* = 47)

Lecture Trainee Attendance (*n* = 47)

Training Evaluation Design and Schedule

The MLTI evaluation leveraged a pre-, mid-, and post-test design to assess Kirkpatrick's four levels of analysis. Trainees completed three assessments: 1) Baseline assessment of MLI-related knowledge and learning objectives, 2) Mid-training assessment for refining the second half of the course, and 3) Post-training evaluation. The baseline assessment was used in combination with the post-test to assess trainee reactions, learning, behavior, and results.

In addition, two focus group sessions were held with small group course faculty to debrief and discuss best practices and lessons learned for improving future MLTI small group sessions. Data from trainees and faculty are included in the report. See Table 4 for the evaluation timeline.

Table 4. Evaluation Metrics and Administration Timeline

	Baseline Assessment	Mid-Training Evaluation	Post-Training Evaluation	Faculty Debrief
Date	**5.5.20**	**7.22.20**	**9.17.20**	**9.30.20 & 10.2.20**
Training Reactions		X	X	
Trainee Knowledge	X	X	X	
Behaviors		X	X	
Results			X	
Course feedback			X	X

Training Evaluation Measures and Results

The evaluation results are presented using Kirkpatrick's training evaluation model in five sections of this report: 1) Trainee reactions, 2) Trainee learning, 3) Trainee behavior, 4) Training results, and 5) Course feedback.

I.   Trainee Reactions

Trainee reactions assess how trainees perceive the course content. Trainee reactions were collected via the post-test. Overall, trainees viewed the experiences and knowledge gained from MLTI very positively. Participants were satisfied with the course structure, small groups (M = 3.94, SD = 1.09), and the lectures (M = 3.94, SD = .998).

MLTI trainees thought that the training was

- **Highly relevant** to research needs (M = 4.63, SD= .65)
- Included theories **applicable** to current research (M = 4.71, SD = .46)
- **Useful** for developing future interventions (M = 4.6, SD = .65)

The positive MLTI reactions suggest the relevance and applicability of the MLTI course content, which is fundamental for facilitating subsequent training outcomes. Specifically, positive reactions correspond to trainees' learning to predict the overall success of the MLTI program.

II. Trainee Learning

Trainee learning evaluates if trainees gained the intended knowledge and skills from participating in the training. The MLTI learning objectives and competencies for each module were used to develop questions for assessing trainee learning.

The learning assessment relied on a pre- and post-training design to compare trainees' knowledge before and after training. The assessment included 28 items and was structured into 5 overarching competency categories:

MLTI Competencies:

i. *Familiarity and knowledge of common and relevant multilevel theories*
ii. *Applying multilevel theory to research and research plans*
iii. *Multilevel intervention design and research methods*
iv. *Multilevel qualitative analyses*
v. *Multilevel quantitative analyses*

Overall, trainee familiarity and knowledge of course content **significantly improved** between the pre-test and post-test across all course competencies. Trainees displayed the greatest level of improvement in the following competency domains: familiarity and knowledge of common and relevant multilevel theories, applying multilevel theory to research and research plans, and understanding of multilevel research methods. For example, trainees identified that they were significantly more confident explaining the role and use of theory in MLI research between the pre-test (M = 2.71, SD = 1.05) and the post-test (M = 4.34, SD = .68; t = 9.09, p < .01). Further, trainees were significantly more confident explaining why constructs are clustered/grouped by different levels of analysis in MLI research, as a result of participating in the MLTI (M = 4.06, SD = .72; t = 7.37, p < .01).

There were less significant improvements between pre- and post-test learning for competencies related to understanding multilevel qualitative analyses and quantitative analyses. For example, though trainee's knowledge of grounded theory analysis significantly improved from the pre-test (M = 2.66, SD = 1.21) to the post- test (M = 3.11, SD = 1.11; t = 3.31, p < 0.01), their average confidence was not as high as noted in previous competencies. Despite this, trainees still had significant improvements in their confidence conducting other types of qualitative assessment as a result of the

MLTI, such as conducting interviews (M = 4.09, SD =.72, t = 7.37, p < .01), focus groups (M = 4.20, SD = 0.83; t = 3.34, p < .05), and content analysis (M = 4.00, SD = 1.03; t = 3.84, p < .01).

The significant changes in trainee knowledge from participating in the MLTI illustrates that the Institute was successful in teaching trainees about the key features and methods central to MLI research.

III.   Trainee Behavior

Trainee behavior evaluates the degree to which trainees apply what they learned during training in their routine work (e.g., as applied to research efforts). MLTI trainees indicated that they planned to integrate course content across a range of areas relevant to their careers. Notably, trainees reported that they would inform colleagues about MLI concepts and the importance of conducting multilevel research.

IV.   Results and Impact of MLTI

Results evaluate the degree to which targeted outcomes occurred because of the training. Overall, the MLTI aimed to:

1) Train healthcare and public health researchers in MLI research to advance the quality of multilevel research and grant applications.
2) Provide participants with a thorough grounding in conducting and reviewing MLI research with a specific focus on cancer care across the cancer control continuum.

Given the distal nature of the first goal (i.e., future grant applications), the evaluation focused on the second goal and additional proximal outcomes. The assessments of both trainee learning and behavior indicate that the course was successful in achieving the second goal.

In addition to these assessments, trainees also rated how well they integrated the course content into their Capstone projects. The Capstone projects allowed us to assess how well trainees were able to transfer course content to their current work. Nearly all participants indicated that they integrated multilevel theory (97%) and processes (97%) into the Capstone projects. The full results of trainee integration of course concepts into their proposal are presented below.

Integration of course content into the Capstone project

- Multilevel theory = 97.14%
- Multilevel covariates = 91.43%
- Multilevel processes = 97.14%
- Multilevel dependent variables = 85.71%
- Multilevel analysis in analysis plan = 82.86%

V. Course Feedback

In addition to assessing the Kirkpatrick 4 levels of evaluation, the post-training evaluation collected qualitative feedback from trainees and faculty to improve the course.

Qualitative Trainee Feedback

Trainee feedback was collected via the post-test survey. Twenty-seven trainees offered suggestions for improving the course of the 40 who completed the post-test.

Key themes that emerged were:

- Reducing the course workload (n = 11)
- Providing additional clarity for course structure and assignments (n = 9)
- Ensuring faculty lecture content is applicable and synchronous across different presenters and topics (n = 9)

Qualitative Faculty Feedback

MLTI course debriefs were conducted with course faculty to collect their feedback. Debriefs draw from several areas of science including information feedback, performance measurement, cognition and memory, group processes, communication theory, and instruction science.[3]

All course faculty participated in one of two debriefing sessions scheduled to collect recommendations for improving the course for future years. The debrief collected feedback on five criteria: 1) Course structure/design, 2) MLTI logistics and materials (e.g., pace of lectures and homework assignments), 3) Training process, 4) MLTI content (e.g., lectures and small groups), and 5) Faculty's interest in participating in the future.

Primary suggestions that faculty offered for improving the MLTI were to:

- Provide additional faculty resources (e.g., sample agendas for small group sessions)
- Clarify the expectations and time commitment for faculty members in advance
- Ensure goal clarity and alignment across trainees so there is an emphasis on the developmental focus of the course
- Restructure the Project Planning Worksheet so it aligns more with Specific Aims for an NIH grant application
- Update course content to ensure construct clarity (e.g., MLTI vs. implementation science vs. complex health intervention)

Conclusion

MLTI was designed to improve understanding and skills in MLI research by cancer care delivery researchers. Proximally, MLTI aimed to equip researchers with the knowledge, skills, and abilities to conduct MLI research in cancer care. In the long term, MLTI hopes to promote a portfolio of research incorporating MLIs and rigorous evaluation methods, and to advance MLI science (theory, methods) in cancer control and prevention.

To evaluate MLTI effectiveness, data corresponding to Kirkpatrick's four levels of analysis were collected, including: 1) trainee *reactions*, 2) trainee *learning*, 3) trainee *behavior*, and 4) organizational *results* stemming from the trainee behavior. Overall, trainee reactions toward MLTI were positive. Trainees expressed that the training was valuable, relevant to research needs, and would be helpful for guiding future research. The positive trainee reactions created a foundation for improving future trainee learning and behaviors.

Trainee learning was evaluated through a pre-/post-test design and assessed trainee understanding of course content and competencies. Trainee knowledge improved significantly between the pre- and post-test across all evaluation competencies. This illustrates that MLTI successfully facilitated trainee learning across course competencies.

Trainee learning, in combination with the positive trainee reactions, increased the likelihood that trainees will incorporate training content into their future behaviors. This was evidenced in trainees' MLTI Capstone presentations where trainees presented their proposed multilevel grants. Nearly all participants indicated that they integrated multilevel theory and processes into the Capstone projects. Trainee integration of course content into the Capstone project/grant proposals illustrates that MLTI was effective in influencing trainee actions to promote multilevel research.

In sum, trainees viewed MLTI positively, displayed significant increases in knowledge and understanding of MLIs, and incorporated course content into their research. The trainees' positive reactions, increased knowledge, and changed behaviors all set the stage for achieving the distal goal of the MLTI: to enhance MLI grant applications.

References

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