SKY
Skills and Knowledge for Youths

SKY PROJECT REPORT NO. 3

GRASPING AND TRAINING THE SKILLS OF GARMENT-SECTOR WORKERS IN ETHIOPIA: FINDINGS FROM ASSESSMENTS AND INNOVATIVE SOFT SKILLS TRAINING

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ACRONYMS

AfDB	African Development Bank
BMT	Behavioral Modeling Training
DID	Difference-in-Differences
GBT	Game-Based Training
GDP	Gross Domestic Product
ILO	International Labour Organization
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JSPS	Japan Society for the Promotion of Science
KAKENHI	Grants-in-Aid for Scientific Research
LMTF	Learning Metrics Task Force
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health and Safety
OJT	On-the-Job Training
PIAAC	Program for the International Assessment of Adult Competencies
SE	Standard Error
SKY	Skills and Knowledge for Youths Project
SME	Small and Medium Enterprises
TVET	Technical and Vocational Education and Training
WRSS	Work-Related Soft Skills

Executive Summary

SUMMARY

Ethiopia is a fast-growing economy, and garment production is one of the key manufacturing sectors that drives it. Accordingly, to cultivate a higher-skilled workforce in this sector, the Government of Ethiopia has expanded Technical and Vocational Education and Training (TVET). Regardless, complaints are ceaselessly heard from employers that their employees lack the skills they demand.

SKY (Skills and Knowledge for Youths) project team of Nagoya University Japan has been working in Africa, particularly in Ethiopia, with the aim to provide evidence-based suggestions for effectively mitigating skills gaps and upskilling workers. In this report, we highlight the findings from the skills assessments and effective improvement of garment-sector workers' soft skills through our innovative training program using board games.

The paper will first introduce the overall characteristics of skills of participated 501 workers in small and medium enterprises (SMEs), grasped through our skills assessment. The assessed skills include cognitive ones such as reading comprehension, calculation, and theoretical knowledge of garment production, aside from practical and noncognitive or soft skills. The necessity of soft skills is identified as always. Based on these assessment results, the next part of the paper presents the findings from our original soft skills training program.

Unlike conventional lecture-based training, the SKY one-day training program is designed to help participants simulate work scenarios in a context similar to the workplace. The psychological theory of behavioral modeling inspired us. The program requires participants to investigate solutions to improve work-related soft skills collectively.

The report will present strongly positive outcomes of this game-based training in five domains of soft skills, namely, (1) occupational health and safety, (2) tidiness and cleanliness, (3) workplace efficiency, (4) product quality control, and (5) teamwork. The effects of the game-based soft skills training were evaluated in two ways: (1) the skills of participants were evaluated before and after the training intervention, and (2) the skills of participants were compared with those of nonparticipant groups.

In conclusion, the report discusses the implications of the outcomes from our package of assessments and game-based training for developing manufacturing workers' skills, particularly soft skills, in developing countries.

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INTRODUCTION

Being at the forefront of African growth, Ethiopia has endeavored drastic reforms of its TVET system to supply the skilled workforce demanded in certain flagship industries, including garment production.

In Africa, since the turn of the millennium, the economic prospect has been bright, driven by several of the world's fastest-growing economies, including those of Ethiopia (8.5% annual growth in 2018; 4th in the world), Rwanda (7.8%; 5th), Ghana (7.6%; 6th), and Côte d'Ivoire (7.0%; 9th) (International Monetary Fund [IMF], 2018). Facing such a positive economic outlook, governments and intergovernmental organizations that promote the sustainable growth of Africa have increased their budgets for and focus on skills development (African Development Bank [AfDB] et al., 2015; World Bank, 2018).

Being at the forefront of African growth, Ethiopia has endeavored drastic reforms of its TVET system to supply the skilled workforce demanded in certain flagship industries, including garment production. Particularly, TVET has seen significant expansion in sectors related to merchandise export, which the government of Ethiopia aimed to increase from US$2 billion in 2009/10 to US$6.5 billion in 2014/15. The major sectors expected to contribute to this growth were commercial agriculture, garments, and textiles (Ethiopia Ministry of Finance and Economic Development, 2010).

Regardless, ceaseless complaints are heard from both the training institutions and employers about the mismatch of expectations and limited collaboration. School-based TVET tends to be inflexible and not cost-efficient, in contrast to today's fast-changing demands for skills and knowledge in the world of work. Given this situation, in recent discussions about TVET and skills development, attention has shifted from the design and implementation of institutionalized education programs to competencies acquired by learners.

To overcome the limitation of institution-based ideas of training and provide evidence-based proposals for effective skills development, the Skills and Knowledge for Youth (SKY) project of Nagoya University was launched to use our academic expertise to capture the multifaceted composition of workers' skills using its unique assessment module. Such an assessment also enabled us to compare the skills workers possess with those demanded by employers. We measure the workers' actual and expected skills in three dimensions: cognitive, noncognitive, and technical. The realities of individuals' skills and employers' expectations of them are still unclear in most industrial contexts in developing countries. Herein lies the demands for the SKY project's constructivist approach to skills assessment.

Another important theme of this paper is our innovative training program for soft skills. In our experience of assessing workers' skills, without any exceptions, we identified the unmet demands for soft skills (Yamada, 2023; Yamada and Otchia, 2022). We were often requested to provide training to improve such work-related soft skills, not just to identify the skills gaps. In response to such requests, we considered our contribution on this front. We recognized that most of the conventional soft skills training is conducted in lecture rooms with limited opportunities for participants to digest the concepts into practice. Observing the gap in demand and availability of effective training programs, the SKY Project developed a one-day game-based training program utilizing Bandura's theory of behavioral modeling training.

This is done via a series of interactive board games coupled with post-game reflection sessions. The developed training program allows workers to learn modeled behaviors, engage in hands-on activities, and practice the modeled behaviors in a simulated work environment. This game-based training approach will ultimately bridge the gap between theory and practice, ensuring the application of the workers' newly acquired skills in their work environments.

In this report, we first discuss the industrial and national context. It will also discuss some theoretical issues that justify our unique interventions. Chapter 3 explains the participants and research design. Then, Chapter 4 will present the general picture of the 501 garment-sector workers who took part in our assessment. It will then be followed by Chapter 5, which introduces the SKY game-based training and its significant outcomes in developing participants' soft skills in a short period. The last part of the paper will draw lessons and policy suggestions from this series of interventions.

1 OVERVIEW OF ETHIOPIA'S TEXTILE & GARMENT SECTOR

Ethiopia has a long history of manufacturing textiles since the first integrated textile mill factory was established in 1939 in Dire-Dawa city. In the 1960s, more integrated private textile mills were established. Despite the nationalization of the private textile mills during the military regime from 1974 to 1991, more integrated textile mills were expanded. At present, the Ethiopian government considers the textile and garment sector as a vital pillar for its ambitious economic industrialization strategy. This is evidenced by the government's rapid expansion of industrial parks to attract foreign investment in the textile and garment industries.

The textile and garment sector has emerged as one of the most significant contributors to value-added manufacturing production and employment. In 2021, the overall export earnings of the textile and garment manufacturing industry were US$181.4 million, accounting for 46.5% of the total manufacturing sector earnings and 0.6% of the total GDP (Ethiopian Monitor, 2022).

This research concentrates on the Ethiopian SME garment and textile industry because of its rapid growth at national and global levels. In the past decade, Ethiopia has successfully transitioned its agricultural economy into a fast-growing industrial economy through transformative industrial policies (Ethiopia National Planning Commission, 2016). The garment and textile sector receives the most attention from the Ethiopian government due to its potential for economic and employment growth (Chang et al., 2016). Staritz et al. (2016) reported an impressive textile export share advancement from US$9 to US$68 million within the five years from 2009 to 2014, and according to Ethiopia's Central Statistical Agency (2018), the gross value-added distribution of the textile and garment industry was around 12 percent in 2017. The textile industry's expansion involves many SMEs, and these significantly contribute to Ethiopian macroeconomic and labor demand (Buli, 2017). According to the Central Statistical Agency (2018), the textile and garment sector engaged around 51,000 workers in 2017.

In parallel with its export-promotion policy, the government invests in vocational education and training (TVET) institutes specifically for textile-related programs (Khurana, 2018). As of 2011, fields in which more than half of graduates were unemployed included weaving and textile engineering, together with woodworking, carpentry, and plumbing. At the same time, more than 50 percent of vacancies in large and medium-sized firms are expected to be filled by skilled production workers, compared with fewer than 10 percent by managers and professionals who hold educational certificates in the liberal arts (Geiger and Moller, 2015). This fact points to a mismatch between labor demand and training, regardless of the expanded demand for and effort to train skilled workers, as well as an urgent need for adequate policy measures to mitigate it.

One of the biggest obstacles to growth in the Ethiopian textile and garment sector is the lack of a sufficiently skilled labor pool, not only in terms of technical skills but also soft skills (Yamada et al., 2018), which results in poor product quality and productivity (Khurana, 2018). In Ethiopia, employers consider teamwork, efficiency, and tidiness to be crucial soft skills (Yamada, 2023). A study by Yost and Shields (2017) discovered severe problems with worker motivation, ability to manage health and hygiene, and safety at the workplace. These circumstances indicate the urgent need for effective training of work-related skills, particularly soft skills, for workers in the garment sector, a main priority of this study.

2 THEORETICAL BACKBONE OF THE SKY INTERVENTIONS

2.1. COMPETENCIES AND THEIR MEASUREMENTS

Regardless of what they are called—21st-century skills, competencies, or employable skills—ideas and policy measures in the recent global trend of education and development are converging toward those that develop learners' problem-solving skills. A practical but significant implication of this shift in priorities is the need to develop the means for assessing such skills. Because the aim is not to examine whether the learner has acquired established domains of knowledge, conventional tests following the curriculum framework are not suited for this purpose (Learning Metrics Task Force [LMTF], 2014).

In the long history of standardized measurements of learning achievement, most tests have focused exclusively on measuring the cognitive dimension of knowledge, such as calculation, reading, grasping concepts, and memorization. However, there is a growing argument that to solve problems, having knowledge is not enough; noncognitive abilities, such as perseverance, motivation, emotional stability, and interpersonal communication skills, are also crucial (Anderson et al., 2001; Bowles et al., 2001; Heckman and Rubinstein, 2001). Moreover, in the case of TVET, students should acquire functional work-related skills (Fastré et al., 2014).

At the same time, as much as school certificates do not represent the workforce's capacities, cognitive skills can explain only part of them. According to Bowles and colleagues (2001), cognitive skills account for only a minor part of the effects of educational attainment on labor market outcomes, and a large part is yet to be explained. One reason for the lack of methods for assessing comprehensive skills, including attitudinal ones, is that the required problem-solving skills differ across industries and contexts. Therefore, the assessment framework should be developed endogenously, based on the specific demands for skills of concerned industries and workplaces. Another challenge is the difficulty of identifying indicators to represent such skills. Recently, an increasing number of academic works on noncognitive (soft) skills in the workplace have been published. One such study untangles the perceived skill demands expressed in job postings, interviews, and questionnaires (Kalauz et al., 2015; Lyu and Liu, 2021). There are also case studies of workplaces observing people who work in response to skill requirements (Grugulis and Vincent, 2009). Other than those studies that examine perceptions and demands, some studies try to grasp the effects of the noncognitive skills of workers on salaries or promotions. Most studies of this type conduct statistical analysis. The variables they use to represent individuals' noncognitive skills are proxies that would suggest certain behavioral tendencies, such as a criminal record, employment in a leadership position (Kuhn and Weinberger, 2005), or length of retention at one job (Kristof, 1996), to represent the behavioral orientation of sample populations (Heckman and Rubinstein, 2001; Kyllonen, 2013; Lindqvist and Vestman, 2011). Regardless of their innovative ideas to examine the demands and rewards for noncognitive (soft) skills, they rarely capture such skills in real work contexts. Also, most of them focus on cases of particular industries in a particular society and do not have a comparative perspective.

Thanks to the creation of large international datasets, which include some measures of adult workers' skills, an increasing number of studies have recently been published that examine the effects of skills on labor market outcomes at the macro (national) levels (Allen and Van der Velden, 2001; Desjardins and Rubenson, 2011; Green and McIntosh, 2007; Pellizzari and Fichen, 2017). The largest dataset of this sort is that of the Program for the International Assessment of Adult Competencies (PIAAC), conducted by the Organisation for Economic Co-operation and Development (OECD). The PIAAC participants were mostly developed countries, but developing countries are joining the program, and the opportunities for analyses of the situations in these countries are also evolving (Tong et al., 2019). Still, those opportunities are limited, and the large datasets do not provide detailed pictures of worker–employer relationships in response to how the skills are developed and evaluated. In summary, there remains the challenge of assessing the varieties of worker skills in a contextualized but comparable manner.

2.2. CHALLENGES TO THE SOFT SKILLS DEVELOPMENT

Literature suggests the importance but difficulty in assessing working adults' comprehensive package of problem-solving skills, which the SKY project measurement can overcome. Now, let us also review literature that discusses the training of noncognitive (soft) skills, another theme of this paper.
Soft skills training for workers has become increasingly targeted by development agencies and training providers (Akolgo-Azupogo et al., 2021; Dar, 2016). However, literature recognizes the challenges in inventing methods and contents of training that make participants adopt behavior and mental orientation for problem-solving.

Often, the ambiguity of the concept of soft skills makes the concrete goal setting of the training programs to be difficult. There are two schools of thought regarding soft skills development: the generalist and the specifist (Kechagias et al., 2011). The generalists believe that soft skills are universal; thus, trainees can learn general concepts of soft skills independently from any particular context (e.g., Ennis, 1993). In contrast, the specifists argue that trainees encounter difficulties adapting the general concept of soft skills in problem-solving in specific contexts. The latter scholars argue that soft skills are better taught in relation to the technical, social, and cultural contexts in which the learners use them (e.g., Dawe, 2002; Laker & Powell, 2011; Moore, 2004; Zhou, 2017). This paper joins the specifist perspective, as our observations suggest that training participants often cannot recognize the relationship between the abstract contents of training and their daily work. Therefore, for the program's effectiveness, it should be designed so that the participants can act on the learned soft skills based on their own conceptions, social values, and experiences.

The selection of a training delivery mode is another challenge. Many training providers use traditional modes of training, such as lecture presentations, that do not involve hands-on practices (e.g., Groh et al., 2012; Ibrahim et al., 2017). Lecturing on soft skills in a generic manner without offering opportunities for practice tends only to deposit declarative knowledge in the minds of learners. Declarative knowledge does not stimulate the learners' consideration of 'how' to do things, which is less likely to be retained (Jiamu, 2012). In other words, for learners to internalize the reasons and goals for certain behaviors, different approaches to training are desired.

Given the difficulty of developing behavioral soft skills, recent studies highlight the necessity of shifting training approaches from classroom- to workplace-based methods. For instance, Talavera and Pérez-González (2007) suggest using the actual workplace as the training site so that trainees can apply their lessons directly to their actual work. Various methods for work simulation have been proposed, including project-based learning, mentor-buddy systems, and role-playing for specific problems at work (Dawe, 2002).

The SKY soft skills training is designed to contribute to overcoming the above-mentioned challenges and to meet the demands for soft skills training. Our training strategy is grounded on behavior modeling theory (Bandura et al., 1961) that stimulates procedural understanding of the causes and goals of problem-solving by offering workplace-simulated rehearsal opportunities. By using board games, we also overcome some of the challenges of work simulation if it is done in the actual workplace during work hours.

3 RESEARCH DESIGN

3.1. PARTICIPANTS

The data set used in this study was collected between October and December of 2022. The training participants surveyed in the study are employed in 21 garment firms in industrial parks on the outskirts of Ethiopia's capital city, Addis Ababa.

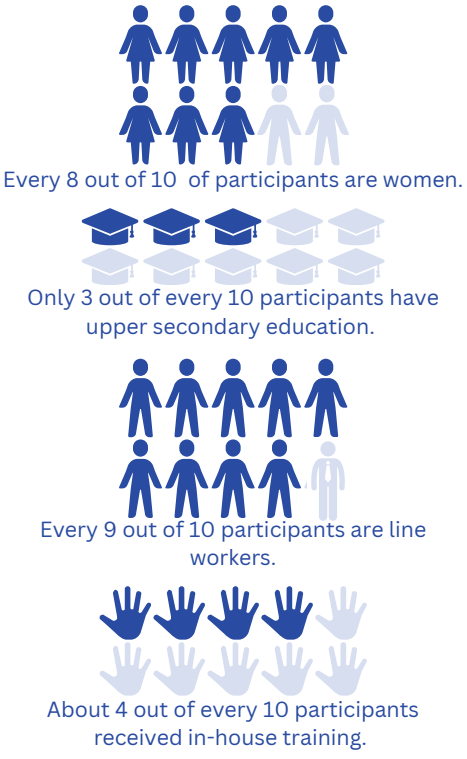
We used a multistage cluster sampling design with the primary units (garment firms) selected by probability proportional to their current number of workers at the time of sampling. The firms were drawn from a list of garment factories operating in Addis Ababa provided by Ethiopian Enterprise Development. Of the 389 garment apparel firms with 31,838 employees, 21 firms were randomly selected to participate in the study. From a list of full-time employees provided by the garment companies, 501 workers were chosen using a simple random sampling proportional to the firm's size. The sample population was limited to full-time employees. In Ethiopia's manufacturing industry, the employee turnover rate is high, and fluctuating orders from clients make employers to hire additional workers temporalily. Given the longitudinal nature of this study, which compares the pre- and post-training performances of same groups of participants, we decided to involve only full-time employees.

Table 1 shows the demographic information of the participants. Most of the them were female, at 81.8%. This reflects the dominance of female workers in Ethiopia's garment sector, where most rank-and-file laborers are women, while supervisory and managerial positions are primarily dominated by men (International Labour Organization [ILO], 2021). The average age of the participants was 25.9 years (with a standard deviation of 5.99). A third of the participants surveyed had an upper secondary

Table 1. Background information on participants by firm size.

	Total	Small	Medium	Large
	N=501	N=141	N=239	N=121
Gender (Male)	18%	21%	17%	17%
Age	26 (6)	25 (6)	26 (6)	26 (6)
Education				
• Below Grade 11	66%	69%	64%	67%
• Above Grade 11	34%	31%	36%	33%
Position				
• Line worker	90%	91%	89%	88%
• Manager/Supervisor	10%	9%	11%	12%
Factory Training				
• No	56%	70%	42%	65%
• Yes	44%	30%	58%	35%

Source: Data from Skills and Knowledge for Youth Program assessment



education, TVET, or tertiary education. The rest of the participants received education up to grade 10. Managers and supervisors made up about 10.3% of the participants. Regarding receiving in-house training, roughly 60% of the participants reported not receiving any on-the-job training.

3.2. THE STUDY FRAMEWORK

As mentioned earlier, the objectives of this study were two-fold: one was to capture the multifaceted composition of workers' skills using its unique assessment module, and another was to implement and evaluate the efficacy of soft skills training program using board games which the SKY project has developed based on its assessment findings and the behavioral modeling theory.

The following sections will explain the research designs and instruments used for this study. First, we will present the design of a quasi-experiment using the SKY skills assessment to examine the efficacy of the training program, and the introduction of the features of game-based training will follow.

3.2.1. QUASI-EXPERIMENT USING THE SKY SKILLS ASSESSMENT MODULE

With its unique research module, our study can comprehensively grasp the detailed contents of actual and self-diagnosed skills of participating workers. It allows us to examine the interrelated effects of the following categories of skills on workers' productivity:

- Cognitive skills: Basic knowledge, literacy, and numeracy, which can be acquired in the classroom.
- Vocational skills: Operational skills for production in specific sectors.
- Noncognitive ("soft") skills: Skills to apply knowledge, conduct appropriate interpersonal relations, follow the rules, and make judgments in order to achieve a required result.

Our survey is composed of three types of instruments: questionnaires, practical and written tests. For this paper, we use the data from a questionnaire given to the workers who took part in the assessment and the workers' test scores. The written test consists of four parts: reading comprehension, mathematics, integrated application of knowledge, and theories of garment production.

The information provided by human resources managers helps us understand the workplace's general characteristics and the demographics of the survey participants.

Data on salary, position, age, education, and self-reported noncognitive skills are taken from the workers' questionnaires, and we use the results of the written tests to calculate variables for cognitive skills. The variables related to the participants' self-reported attitude at work (noncognitive/soft skills) are constructed from questionnaire items. We developed these items on noncognitive/soft skills after coding and categorizing occupation standards of multiple countries to grasp common expectations across countries, with some input from Ethiopian and Japanese specialists in garment production management.

The questionnaires capture the changes in work-related soft skills of occupational health and safety (OHS), tidiness and cleanliness, workplace efficiency, product quality control, and teamwork. Variables for each work-related soft skill were constructed from 15 psychometric scale items the SKY Project team developed. Questions about participants' educational and demographic backgrounds and work experiences were also included. Firm-level data was captured using questionnaires provided to human resources managers of the firms that participated in the study.

We used the same standardized SKY framework for pre- and post-training assessment, which enabled us to examine the changes in skills caused by the intervention. It was a quasi-experimental design to analyze the impact of game-based soft skills training.

The participants were divided into intervention (trained) and control (untrained) groups, with the former receiving the game-based training (Figure 1). We analyzed the data by controlling for individual and firm-level factors such as gender, age, education, wage, position, and factory size to assess the training's impact on participants' self-reported work-related soft skills.

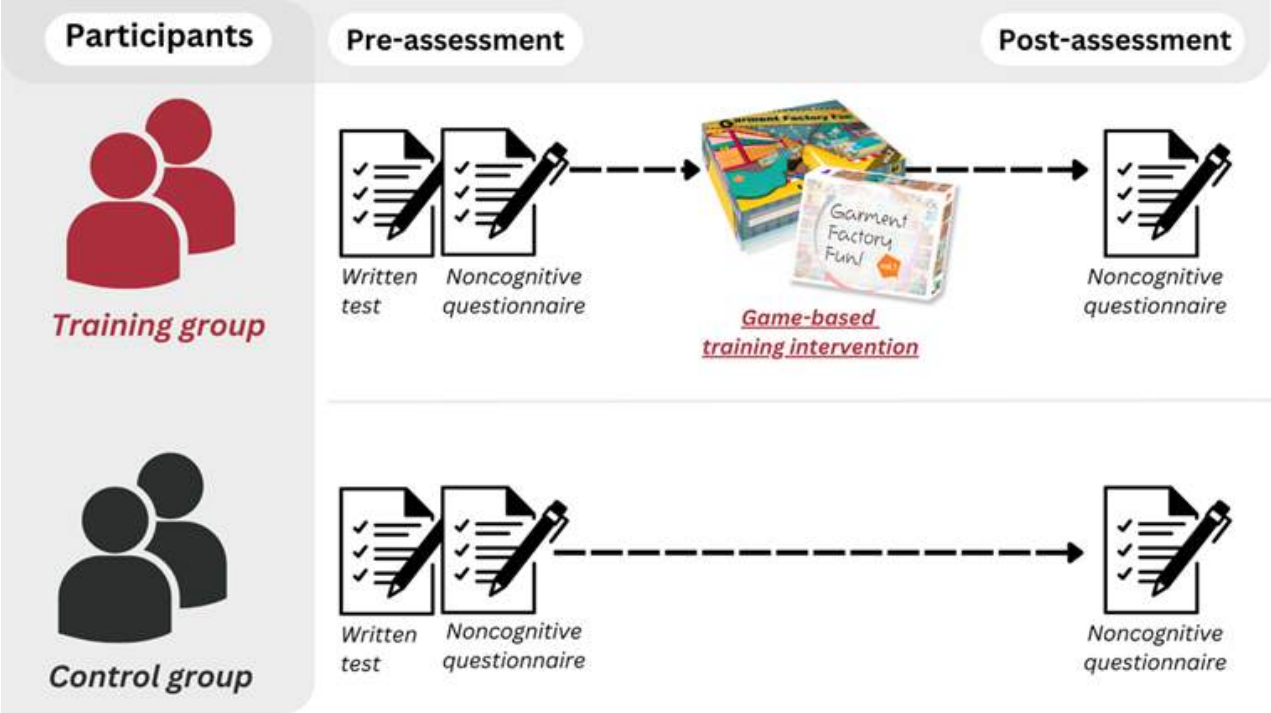


Figure 1. The experimental framework

3.2.2. GAME-BASED SOFT SKILLS TRAINING

The one-day training program is designed for garment manufacturing workers, from recently hired line operators to supervisors of production lines. In this program, we develop the capacity and motivation to contribute to the line's collective productivity. The training also aims to allow trainees to conceptualize soft skills and apply them to real-life workplace situations while enjoying games with colleagues. Therefore, our training program is designed to foster workers' individual soft skills by considering their commitment as members of the firms, leading to a more significant contribution to the line's and the factory's shared goals.

Table 2 shows the structure of the one-day training program. The training comprises two sessions, each focusing on one of the two developed board games. The whole training starts with the program introduction, in which trainees are informed of the training's objective and have an opportunity to brainstorm about their understanding of enhancing productivity. Each game then starts with its own introduction and concludes with a reflection session. The introduction session briefly explains the rules, the game's objectives, and some basic ideas involved in the game. The reflection session is essential for participants to internalize and conceptualize what they experienced during the game. Participants are encouraged to discuss and reflect on their behavior while considering its implications for their actual work on the production line, in order to grasp the norms and values that underlie the actions needed to succeed in the games.

Table 2. The overall structure of the training program

Session	Time	Activity		Training Contents
First Session	15 mins	Introduction session		The objective of this session is to present learning points to trainees to have them grasp the purpose of the training. The main facilitator asks trainees to brainstorm and share how to improve garment workers' productivity.
	10 mins	**Garment Go Round**	Game introduction	This game is an intragroup competition. Trainees will learn the concept of soft skills while competing with other players.
	60 mins		Game playing	
	30 mins	Reflection activity		Trainees discuss the skills learned and discover the connection between their reality and the skills.
60-minute lunch break				
Second Session	10 mins	**Garment Factory Fun**	Game introduction	This game is an intergroup competition. Trainees must apply soft skills learned in the first game to be the most productive production team.
	90 mins		Game playing	
	30 mins	Reflection activity		Each team discusses and shares the strategies that influenced their productivity. Trainees are guided to think of the behaviors from the game that can be applied to their reality.
	15 mins	Wrap-up Session		This session aims to help trainees make sense of the soft skills in their work situations. Trainees will discuss skills they can bring back to their work environment, and share their ideas with the larger group.

SOFT SKILLS TARGETED BY THE TRAINING

In-depth consultations with local experts and observations of the working environment were conducted to understand what problems frequently happen and determine the soft skills necessary to prevent them. As a result, the developed training program targets skills that fall into four measurable domains of work-related soft skills: (1) occupational health and safety (OHS), (2) tidiness and cleanliness, (3) efficiency, and (4) quality control. In addition, the training module's conceptual framework is cross-cut by (5) collaboration or teamwork skills, as depicted in Figure 2.

Figure 2. Conceptual framework of soft skills targeted by the training program

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Figure 3. The developed board games used in behavioral modeling training

GAME DESIGN

The two board games we developed for our soft skills training are Garment Factory Fun 1 and Garment Factory Fun 2 (Figure 3). Garment Factory Fun 1 uses illustrated cards to model soft skills, boosting retention. Garment Factory Fun 2 replicates factory challenges, enabling behavior rehearsal and skills transfer. Participants assume various roles inside the firm, collaborating to meet orders while overcoming obstacles. Post-game discussions after each game reinforce learning.

Our games integrate Behavioral Modeling Training (BMT) elements proven to enhance skills transfer: rule codes, mental rehearsals, workplace simulation, and social reinforcement. Game rules encode learning goals. Soft skills cards promote the mental practice of soft skills. Lastly, the game design mirrors the factory setting, and players receive instant feedback on their progress, enhancing motivation.

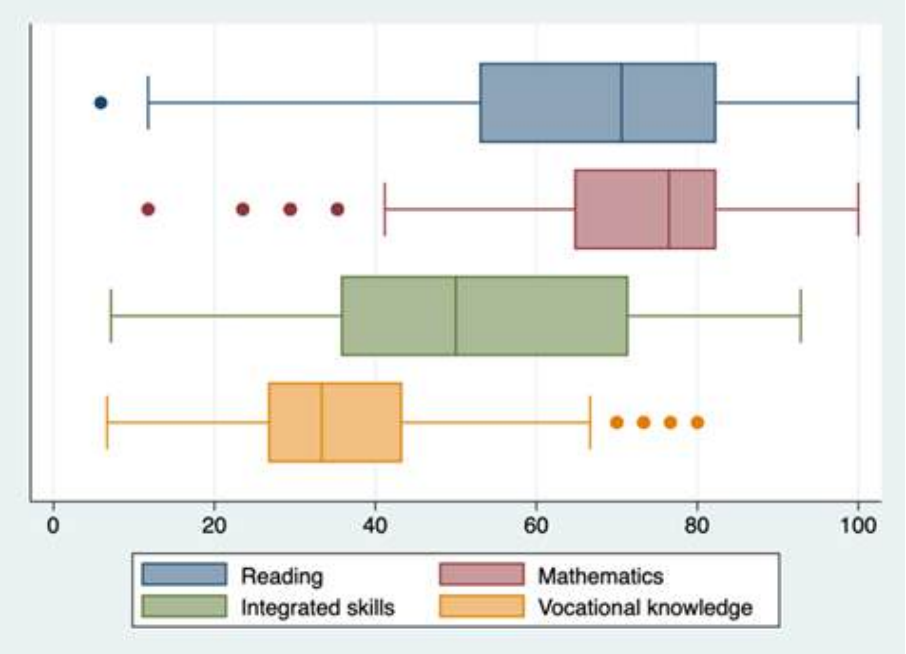
Through our board game training program, we can effectively cultivate work-related soft skills, aligning with real-world requirements by utilizing established BMT principles. By offering offline accessibility and context-specific training, we address challenges African populations face, contributing to skill enhancement in the garment industry.

4 OVERALL RESULTS OF SKILL ASSESSMENT

This section illustrates the overview of participants' performance, including the relationship between different types of skills and their determinants. First, the box plot graph shown in Figures 4, 7, and 8 demonstrates average scores and variance of participants' performance on written examination, personal characteristics, and work-related soft skills by skills domains. The graphs visualize test scores using boxes and whisker plots. The vertical lines in the boxes show mean scores for different skill domains. Box widths represent score distributions, and whiskers indicate the maximum and minimum scores. Dots outside whiskers are outliers. Narrower boxes and shorter whisker ranges suggest scores are close to the average, while wider boxes and longer whiskers indicate more scattered scores among participants. Figure 5 shows the relationship between the cognitive and noncognitive skills explored by our skills assessment. Finally, we examine how background factors affect workers' cognitive scores.

4.1. COGNITIVE SKILLS

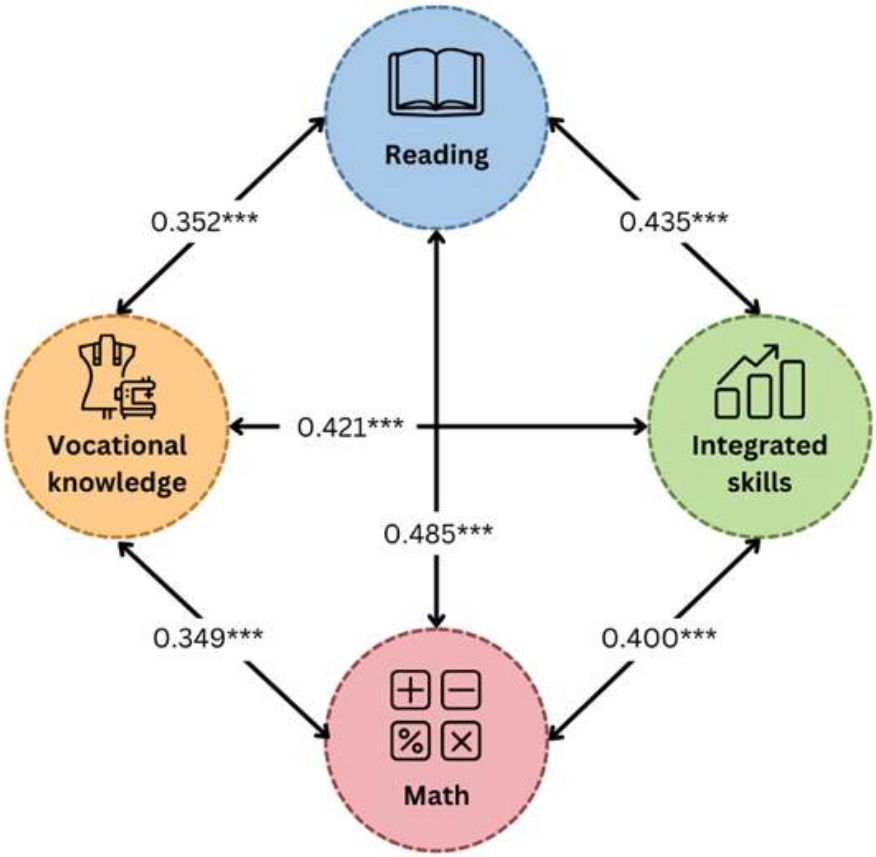
Figure 4 summarizes the written test results, categorized into four domains, namely (1) reading, (2) mathematics, (3) integrated skills (or information gathering), and (4) vocational knowledge. The result shows that the average scores in reading and mathematics are significantly higher than those in integrated and vocational skills. The average score of vocational knowledge is the lowest. The narrow box for mathematics and vocational knowledge indicates that the score variation among the workers is small. On the other hand, the score distribution of integrated skills is the widest. The integrated skills require the participants to utilize mathematics and reading literacy to gather information through graphs and tables. Hence, the high variation and the significant gaps between integrated test scores and those of mathematics and reading indicate that workers need higher analytical capabilities to solve complex problems by combining multiple skills, compared to straightforward questions in reading and mathematics.



Source: Data from Skills and Knowledge for Youth Program assessment

Figure 4. Average and variance of written test results

According to Figure 5, the domains of cognitive skills strongly correlate with each other. First, reading and calculation skills correlate significantly with integrated skills, with .435 and .400 respectively, at the .001 probability level. However, the results indicate that workers' ability to read contributes to the understanding of complex tables and graphs more than the ability to calculate. Second, the contribution of integrated skills to a good theoretical understanding of vocational skills (.421 with $p < .001$) is more notable than that of the reading and calculating capabilities. This finding reveals that analytical capacities to solve complicated questions can establish advanced vocational knowledge.



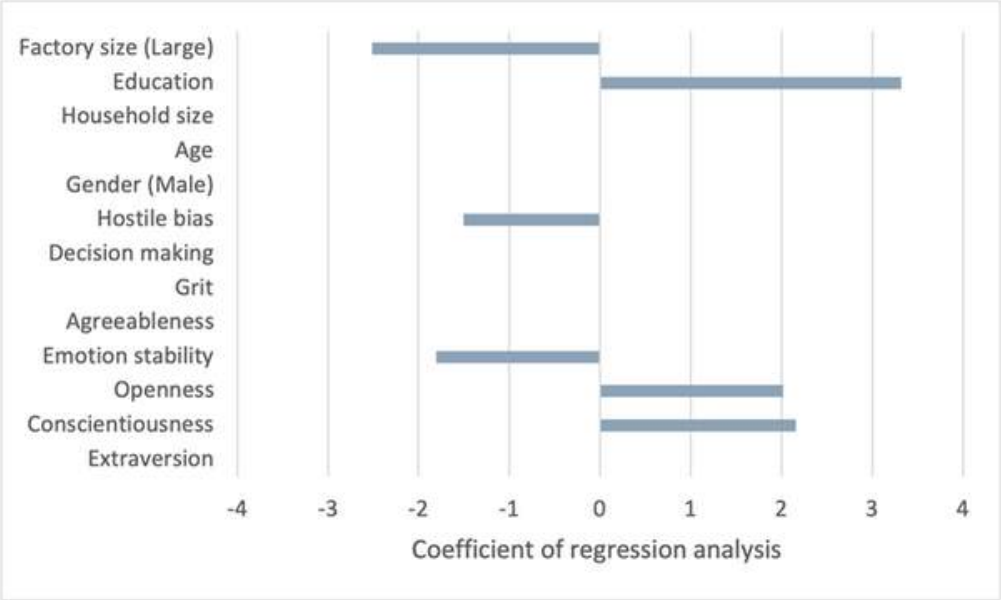
Note: ***Pairwise correlation is significant at the .001 level (two-tailed).
Source: Data from Skills and Knowledge for Youth Program assessment

Figure 5. Relationship between written test by subjects

In addition to the relationship among skills, we examine the effect of background factors on the written test score. The explanatory variables in Figure 6, include participants' demographic background, household size, education attainment, factory size, and personality traits. The coefficients for the independent variables were determined through a regression model employing ordinary least squares, with the dependent variable being the test scores. The blue bars represent how the listed items influence the written test results. A longer bar, indicating a larger coefficient, signifies a more substantial effect. A bar extending to the left represents a negative impact, while those stretching to the right indicate positive effects. The coefficients were shown as zero for the factors with no significant effect in the graph.

The finding indicates that workers with higher education attainment perform better in the written examination. However, there is no difference between female and male workers. Second, the effect of factory size is negative, pointing out that workers from smaller factories tend to have higher written test scores. On the other hand, it is notable that participants' personality traits significantly influence the written test results. Hostile bias and emotional stability have negative effects on written test scores, while openness and conscientiousness positively affect the results. According to this finding, workers who enjoy learning new things and perceive others' ambiguous behaviors as nonthreatening, while following socially prescribed norms and rules, tend to perform excellently in the written examination. In contrast, workers

who are better at handling negative emotions tend to have lower cognitive test scores. This phenomenon signifies that noncognitive competencies are one of the key factors in enhancing workers' cognitive skills.



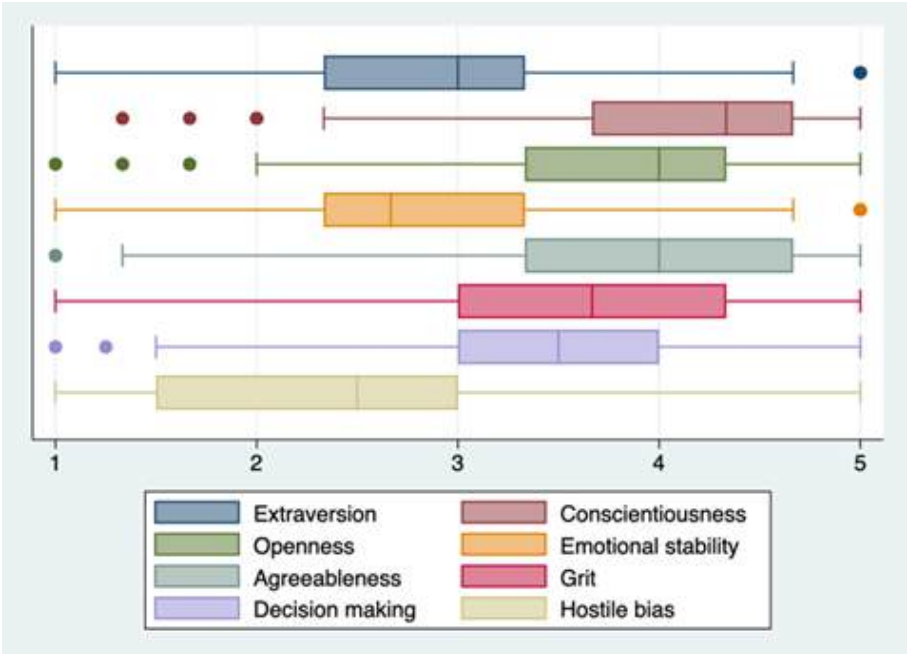
Note: Unit is the coefficient of regression analysis.

Source: Data from Skills and Knowledge for Youth Program assessment

Figure 6. Influential factors on written test results

4.2. NONCOGNITIVE SKILLS

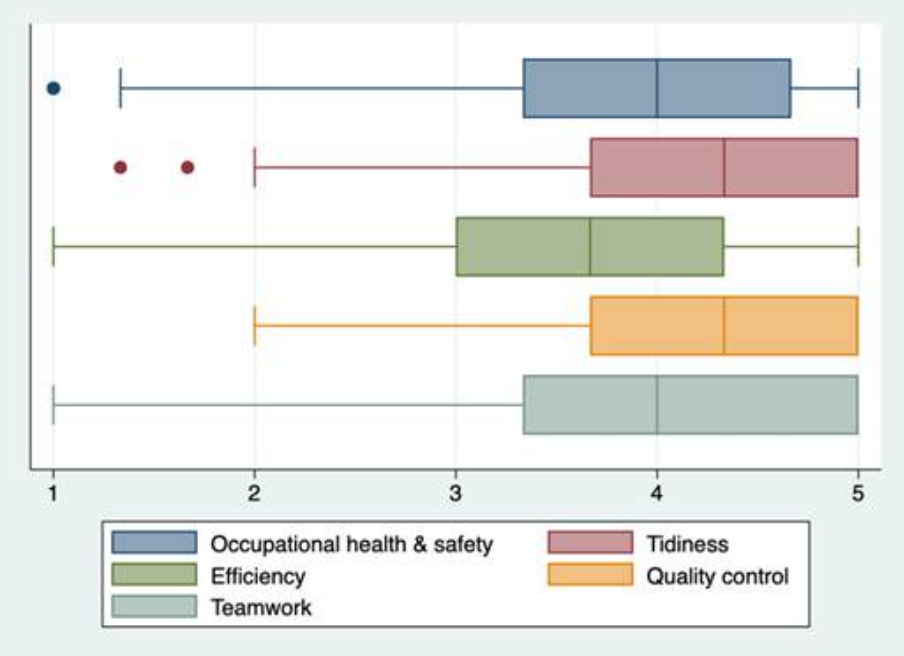
The previous section discovers a significant relationship between workers' cognitive and noncognitive skills. Therefore, this part will elaborate an overview of the participants' noncognitive skills assessment, including their personal characteristics and work-related soft skills. Figure 7 demonstrates the average and variance of workers' eight personality traits. The highest mean scores among the eight domains are conscientiousness, openness, and agreeableness. The finding indicates that the participants tend to conform to societal standards, enjoy exploring new things, and have a cooperative orientation to others. Another remarkable finding is that the average of hostile bias is relatively low. Despite the high variation, this implies that the workers perceive others' behaviors as nonthreatening.



Source: Data from Skills and Knowledge for Youth Program assessment

Figure 7. Average and variance of workers' personal characteristics results

In addition to the personality traits, the SKY assessment also captures work-related soft skills (WRSS). The work-related soft skills consist of five domains, namely 1) occupation health and safety, 2) tidiness, 3) efficiency, 4) quality control, and 5) teamwork. The assessment measures the WRSS twice, before and after the training intervention, which will be elaborated in detail in the later section of this report. This section illustrates only the WRSS overview of all participants before receiving any intervention. The box plot graph in Figure 8 demonstrates the average and variation of each WRSS domain. The score distribution has no considerable difference between the five domains. The average tidiness and quality control scores are the highest, while the efficiency score is the smallest.

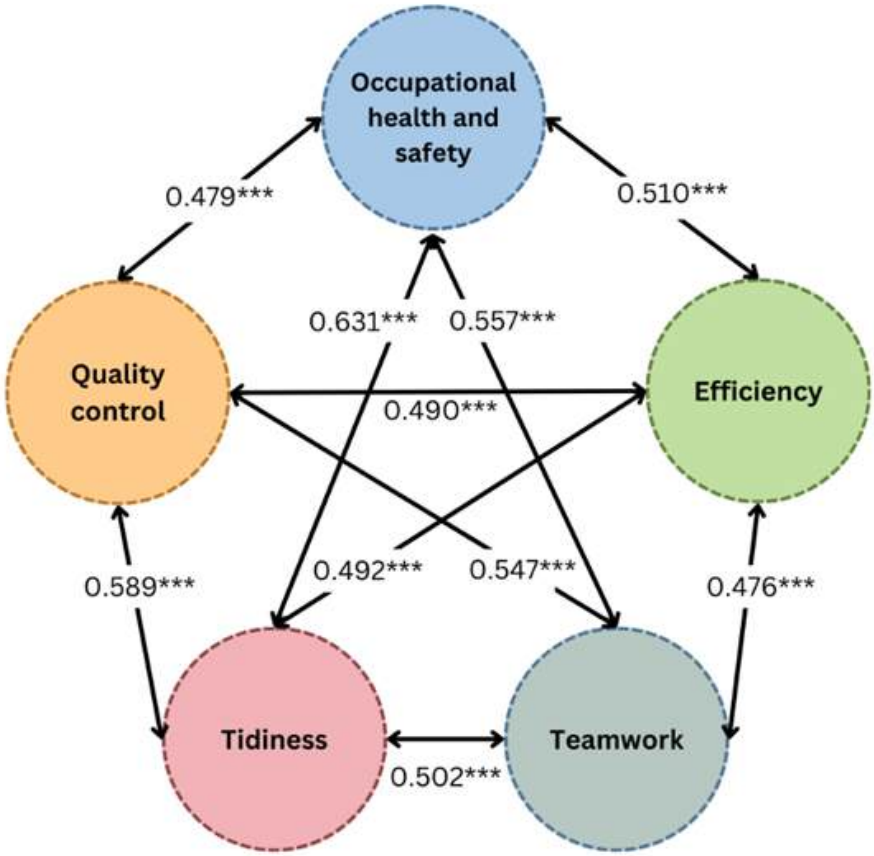


Source: Data from Skills and Knowledge for Youth Program assessment

Figure 8. Average and variance of work-related skills results

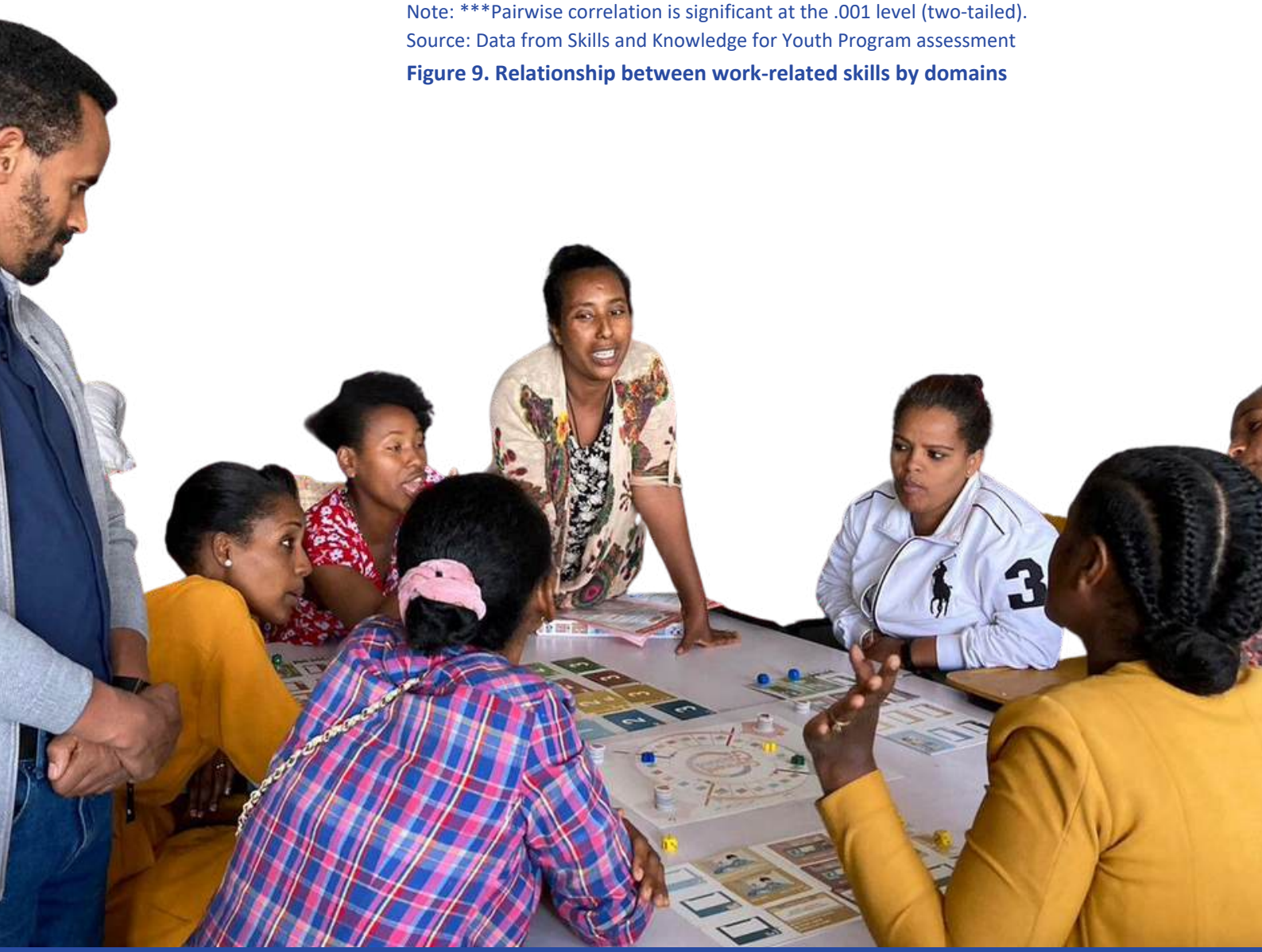
Additionally, Figure 9 demonstrates the pairwise correlation results between the five domains of WRSS. The results show that every skill domain significantly correlates with each other at the .001 level (two-tailed). The most outstanding correlation is between tidiness and occupational health and safety, with .631. This indicates that workers who are attentive to tidiness at the workplace, tend to be highly aware of health and safety during their duties. Likewise, the second largest correlation size is between tidiness and quality control, with .589 ($p < .001$). Workers who pay attention to neat and clean workplaces are also accurate in the observation of product quality standards.

Given the preliminary results in the overview part, noncognitive competencies are markedly associated with cognitive parts of workers' skills. Therefore, we initiated non-conventional soft skills training using board games, which aims to increase workers' productivity. In the next section, this report will present the result of a quasi-experiment proving the effects of game-based soft skills training on workers' work-related soft skills.



Note: ***Pairwise correlation is significant at the .001 level (two-tailed).
Source: Data from Skills and Knowledge for Youth Program assessment

Figure 9. Relationship between work-related skills by domains



5 THE EFFECT OF GAME-BASED TRAINING ON WORK-RELATED SOFT SKILLS

This section will investigate how game-based training grounded on behavioral modeling theory influences workers' work-related soft skills. Based on the theory of behavioral modeling, we will explore in this section how game-based training will affect workers' noncognitive (work-related) skills in Ethiopia's booming garment industry. In doing so, we will understand how soft skills are developed and provide policy suggestions to improve the country's soft-skills training and development.

We used 15 items from the worker questionnaires to compose variables to represent the various work-related soft skills. For each item, workers were asked to provide their opinions on the importance of a particular workplace behavioral trait, based on a five-point Likert scale ranging from 1 = not important to 5 = very important. We then assigned each item to one of the five variables to represent the workplace-related soft skills we wanted to analyze: 1) occupational health and safety (OHS); 2) tidiness; 3) efficiency; 4) quality control; and 5) teamwork. We then used confirmatory factor analysis to verify whether the items contributed to measuring the intended trait. The factor analysis results are summarized in Table 3. All items exhibited positive and significant factor loadings, meaning that the items in the soft skills assessment module can be effectively used to measure work-related soft skills and give us a better understanding of how these skills are developed.

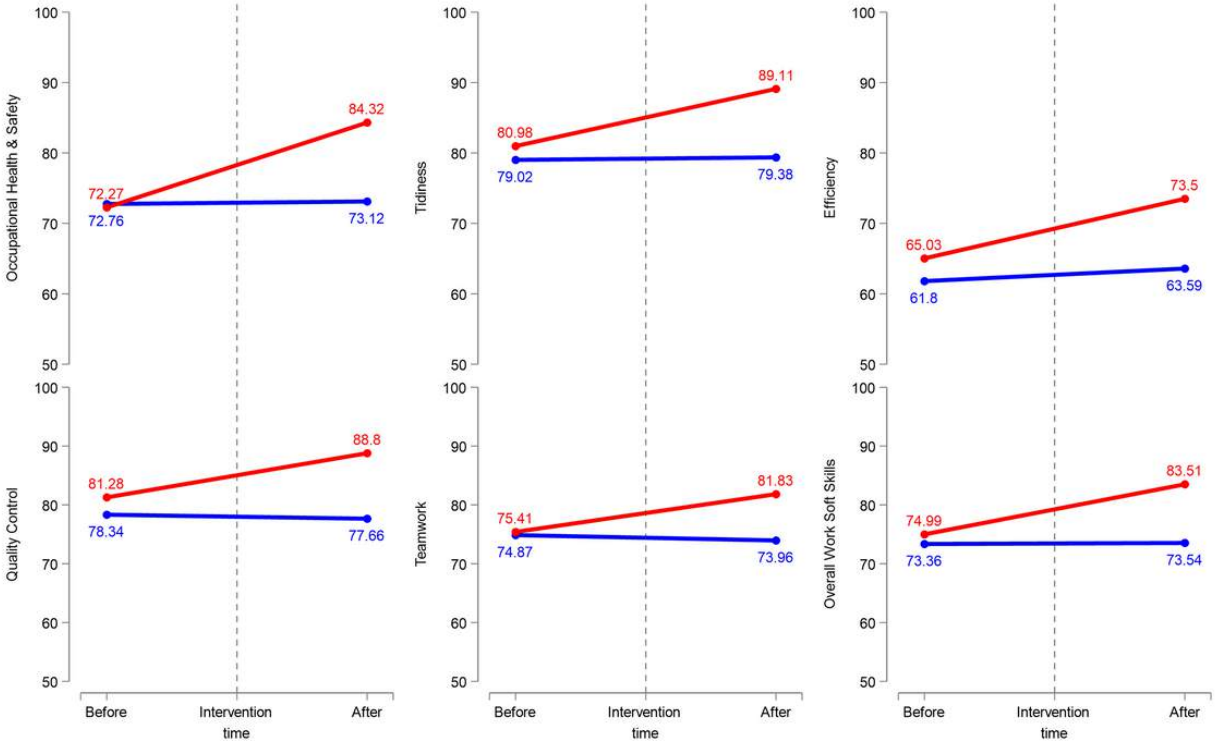
Table 3. Result of confirmatory factor analysis on work-related soft skills

Factor	Question Item	Coeff.	SE	p
Occupational Health and Saftey	All workplaces have a first aid kit for the emergency care of an injured or ill person.	0.596	0.0333	0.00
	Workers use protective equipment while operating machines.	0.664	0.0334	0.00
	Workers wear clothes that are safe and easy to move.	0.658	0.0309	0.00
Tidiness	Tools are kept neatly in the toolbox.	0.791	0.038	0.00
	Tools are returned to the same place after use.	0.679	0.0351	0.00
	Waste is disposed into the designated trash bin.	0.519	0.0314	0.00
Efficiency	Workers do not make personal phone calls during work hours.	0.38	0.0507	0.00
	The record of the material inventory is up to date.	0.701	0.0478	0.00
	The materials are stored in the places which have the item labels.	0.586	0.0371	0.00
Quality Control	Workers observe the sample product first to know how the final product should be.	0.601	0.0416	0.00
	Defective products are reported to the supervisor when they are found.	0.592	0.0319	0.00
	Workers are careful not to damage or contaminate the materials and products.	0.588	0.0307	0.00
Teamwork	Workers help each other when they need assistance.	0.498	0.0289	0.00
	If any unusual situation occurs during work, the workers share that with colleagues.	0.539	0.0377	0.00
	Workers pay attention to colleagues so that any signs of trouble and dangers will be found.	0.532	0.0399	0.00

Source: Data from Skills and Knowledge for Youth Program assessment

5.1. Game-Based Training Results

The following section presents our findings on the five domains of work-related soft skills between the intervention and comparison groups before and after the game-based training. We find that the game-based training significantly impacts the participants' soft skills development. This section will also discuss the factors that influence soft skill development in garment sector workers.



Legend: Trained ( ), Untrained( )

Source: Data from Skills and Knowledge for Youth Program assessment

Figure 10. Changes in OHS, tidiness, efficiency, quality control, teamwork, and average work-related soft skills between the trained and untrained groups

Figure 10 shows the changes in each work-related soft skill before and after the implementation of game-based training for both trained and untrained workers. Before the training, the values of the various work-related soft skills and their average were comparable between the two groups. We can see that work-related soft skills for the trained group increased significantly after the training. In contrast, the work-related soft skills of the comparison group remained relatively the same. The results indicate that the game-based training intervention had a statistically significant effect on all five domains of work-related soft skills. The participants in the intervention group demonstrated percentage point gains ranging from 6.42 to 12.1 percent compared to the untrained group.

A difference-in-differences (DID) regression approach was used to measure the actual training effects on the population that underwent the game-based training. The DID approach is employed primarily in quasi-experimental design studies that use panel data obtained from a baseline and treatment group to obtain a counterfactual to estimate the treatment's effect

Table 4 presents our findings on the impact of game-based training on participants' work-related soft skills after controlling for other factors such as age, gender, education, wage, position, factory size, and on-the-job training (OJT). In all five domains of work-related soft skills and overall average, the Game-based training (GBT) impact shows that the intervention had a significant effect on participants, with percentage point gains across all self-reported work-related soft skills scores ranging from 6.69 to 11.7 (Table 3, models 1 to 5). Model (6) shows that, on average, the intervention effect is at 8.34 percentage points (8.34 / 27.2 = 30.6% change). All GBT Impact estimators are positive and significant, at least at the 1% level. Also, the effect size of our training program was significantly higher than those reported by earlier studies. For comparison, we computed the game-based training effect size to be 0.52, whereas past BMT trainings only have an effect size of 0.25. A twofold increase!

Table 4. Actual impact of gamed-based BMT on work-related soft skills

	Soft skill (1) OHS	Soft skill (2) Tidiness	Soft skill (3) Efficiency	Soft skill (4) Quality control	Soft skill (5) Teamwork	Average of all work-related soft skills (6)
Post	0.357	0.357	1.783	-0.681	-0.908	0.182
	(-1.658)	(-1.455)	(-1.744)	(-1.552)	(-1.786)	(-1.21)
GBT	-0.437	0.637	1.243	1.249	0.387	0.616
	(-0.806)	(-0.689)	(-0.844)	(-0.728)	(-0.839)	(-0.534)
GBT Impact	**11.699*** **	**7.772*** **	**6.687** **	**8.195*** **	**7.329** **	**8.336*** **
	(-2.359)	(-2.043)	(-2.414)	(-2.001)	(-2.351)	(-1.633)
Gender	0.873	0.228	-2.195	-0.35	-0.607	-0.41
	(-1.123)	(-1.091)	(-1.342)	(-0.855)	(-1.202)	(-0.856)
Age	-0.057	-0.035	0.061	0.024	-0.001	-0.002
	(-0.083)	(-0.06)	(-0.078)	(-0.059)	(-0.066)	(-0.051)
Education	-0.016	-0.594	0.178	0.245	-0.45	-0.127
	(-0.903)	(-0.841)	(-0.925)	(-0.762)	(-0.928)	(-0.681)
Wage	-1.082	0.006	-0.025	-0.191	-1.247	-0.508
	(-1.104)	(-1.303)	(-1.216)	(-0.89)	(-0.866)	(-0.944)
Position	1.4	0.972	3.268*	0.916	2.303*	1.772*
	(-1.091)	(-0.975)	(-1.482)	(-1.039)	(-1)	(-0.819)
Factory size	-0.226	-0.253	-0.376	0.23	1.673**	0.209
	(-0.652)	(-0.58)	(-0.619)	(-0.544)	(-0.59)	(-0.468)
OJT	1.037	0.025	1.918*	0.542	-0.536	0.597
	(-0.907)	(-0.778)	(-0.893)	(-0.752)	(-0.872)	(-0.645)
Constant	29.498**	27.709**	19.566*	28.036***	32.806***	27.523***
	(-8.979)	(-10.27)	(-9.765)	(-7.123)	(-7.008)	(-7.545)
R-squared	0.509	0.499	0.422	0.47	0.425	0.534

Source: Data from Skills and Knowledge for Youth Program assessment

Notes: Cluster-robust standard errors are in parentheses.

All models include pre-training covariates of work-related soft skills: OHS pre, tidiness pre, efficiency pre, quality control pre, and teamwork pre.

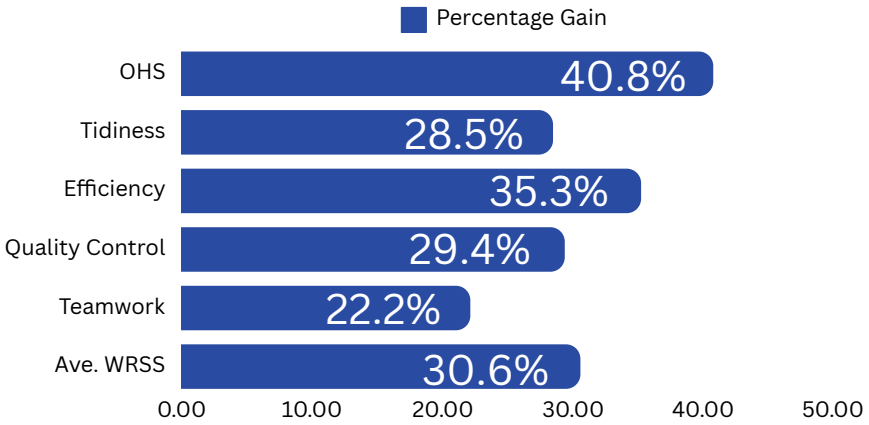
* p < .05; ** p < .01; *** p < .001

One of the domains of work-related soft skills for which the game-based training had the biggest effects were OHS (11.7 / 28.7 = 40.8% change) and quality control (8.20 / 27.9 = 29.4% change). These results indicate that before this training, participants had not been exposed to the concept of taking personal responsibility for their health, workplace safety, and quality control. After participants were provided with behavior models and game-based rehearsal opportunities to consider these workplace issues, they retained their training.

The soft skills of tidiness and efficiency also benefitted significantly from this training. Keeping workstations tidy and clean and performing assigned tasks efficiently are frequently mentioned by employers as fundamental soft skills for newly employed workers. The study results suggest that mutual enforcement of supervisors' daily advice and organized training interventions like ours would enhance the development of these soft skills among workers. The fact that the variable OJT (2.034, p = .027) has a significant effect on the improvement of efficiency skills supports the interpretation that some support already exists within workplaces to improve these soft skills, albeit insufficiently, and that OJT enhances the efficacy of BMT.

In some domains of soft skills, being in a managerial position affects the impact of BMT. Regarding efficiency and teamwork, managers outperformed others (3.43 at p = .028 and 2.169 at p = .044, respectively). This trend is also found in the overall average score of work-related soft skills (1.83 at p = .036).

Figure 11 summarizes the percentage point changes in each domain of measurable work-related soft skills.

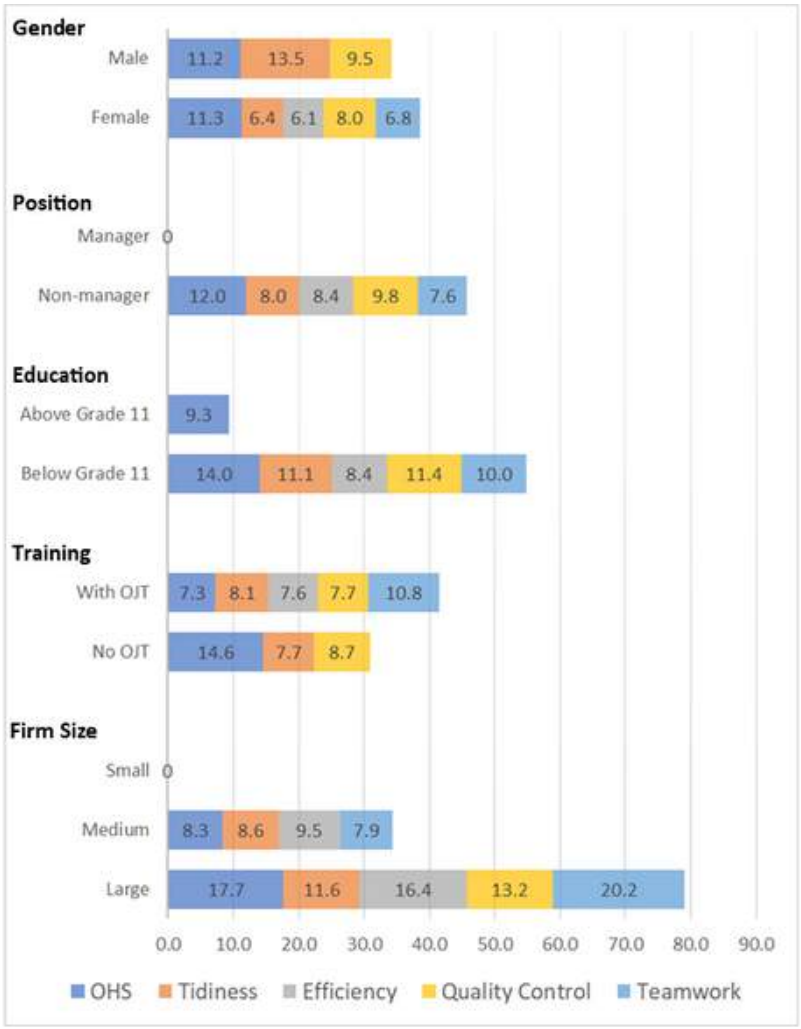


Source: Data from Skills and Knowledge for Youth Program assessment

Figure 11. Percentage change in OHS, tidiness, efficiency, quality control, teamwork, and average work-related soft skills between the trained and untrained groups after controlling for other factors like age, gender, education, etc.

5.2. Heterogenous Analysis of Work-Related Soft Skills Gains

Figure 12 shows the percentage point gains in work-related soft skills disaggregated by gender, position, education, training, and factory size. We see that non-manager female workers without higher education from medium and large firms would benefit the most from our BMT game-based training program.



Note: Insignificant GBT Impact is denoted as zero.

Figure 12. Percentage gains in work-related soft skills disaggregated by gender, position, education, training, and factory size

Disaggregating the game-based training effects by gender shows that female workers gained more from the training than their male counterparts. All WRSS significantly increased for female workers, whereas males only improved in terms of OHS, tidiness, and quality control. When analyzing the training impact by the trainees' position in the firm, only non-managers or line workers had significant gains in their WRSS. Training effects by participants' level of education show that those without upper secondary education benefit the most from the game-based behavioral modeling training. The finding suggests that these subgroups do not possess the relevant work-related soft skills demanded by Ethiopia's garment and textile industry. Considering that the pool of human resources employed in the garment industry are women (82%), non-managers (90%), and with education below upper secondary (66%), Ethiopia's garment sector lacks a skilled workforce that is demanded by the industry.

Looking at whether or not participants received in-house training or not, participants who received OJT gained the most from the training, especially in the domains of efficiency and teamwork. The findings highlight that existing training provided by the firms is insufficient.
Analyzing the impact of the training by firm size reveals that medium and large firms stand to gain the most from the training intervention. The findings highlight that medium and large firms have a workforce that lacks the necessary work-related soft skills.

Overall, the study provides empirical evidence that game-based training grounded in behavioral modeling theory can effectively enhance work-related soft skills among garment sector workers. The results highlight the importance of incorporating contextualized training interventions and providing opportunities for rehearsal and skill transfer in the workplace.

These findings have significant implications for policy and practice in the garment sector and beyond. By recognizing the value of game-based training and its impact on soft skill development, policymakers and training providers can design and implement effective training programs that address the specific needs of workers in various industries. The study underscores the potential of game-based training approaches in developing countries, where access to computers and the Internet may be limited.

6 CONCLUSION

CONCLUSION

The findings, based on a quasi-experimental DID approach, demonstrate that the game-based BMT training program has a statistically significant effect on improving Ethiopian garment workers' work-related soft skills. The computed effect size for our training is also larger than the effect size of previous forms of BMT training. Therefore, this study contributed statistical evidence of the efficacy of contextualized soft skills training. Work-related skills training conducted in the workplace requires employers to commit time, space, and human resources needed for operations. However, we have demonstrated that by using board games to represent simplified workplace realities and combining them with a BMT approach, our one-day training program can minimize the resources required to effectively train soft skills and incorporate work-simulated rehearsal opportunities for better motivation, retention, and skills transfer.

In addition to the main results of our study, we identified subgroups that benefit the most from the game-based training intervention. The study identified that non-manager female workers without higher education from medium and large firms benefit the most from our game-based training program.

We want to emphasize that the BMT approach using physical games is well-suited to developing countries like Ethiopia. BMT training has been proven by scholars to be effective, but most studies have used web- or computer-based games, which can be expensive to implement and potentially exclude the participation of underprivileged populations. Access to a computer or the internet remains relatively rare in many developing countries like Ethiopia. Given these conditions, our game–based BMT using physical boardgames has great potential to support young industrial workers in Ethiopia and many other developing countries.

This study provides a new perspective on how soft skills training can be conducted using a game-based training approach aside from the traditional rote-based lecture trainings provided. Our study also bridges the missing link between the ongoing discussion on the importance of soft skills and the lack of effective training methods.

7 POLICY LESSONS AND SUGGESTIONS

Based on the results, we suggest policymakers and industry stakeholders can consider the following policy actions to promote the development of work-related soft skills, for production line workers in manufacturing sectors in developing economies:

01 More participatory training in the environment closer to the actual workplace is important for improving soft skills.

Prioritize more participatory training situated in environments closely resembling the actual workplace to enhance soft skills. Even when workers received in-house training, those who underwent training still exhibited gains comparable to their untrained peers. This underscores the limitations of traditional training methods, such as lecture-style presentations, which lack hands-on learning components. The following are suggestions to improve Ethiopia's current soft skills training program:

1. Incorporate game-based training grounded in behavioral modeling theory into existing soft skills training initiatives.
2. Encourage collaboration between training providers, industry associations, and garment firms to integrate game-based behavioral modeling training into existing on-the-job training to enhance workers' soft skills development further.
3. Allocate resources for developing and distributing board games that simulate workplace environments for soft skills development.

02 Target the training for women, less skilled and inexperienced population in SMEs.

The study has shown population subgroups that had significant gains when using a game-based behavioral training approach. The following are suggestions for different population subgroups to develop a more motivated and skilled workforce:

1. **Women.** Developing targeted game-based training programs for women in the garment sector will address the gender disparity in work-related soft skills.
2. **Non-managers.** Training programs tailored explicitly for non-managerial workers with low educational attainment will provide them with the necessary soft skills for professional growth and development.
3. **Workers from medium and large firms.** Game-based training is effective, particularly in medium and large firms. Focusing on this subgroup will ensure the development of the necessary soft skills across the industry.

03 Collaboration and sharing are the keys to soft skills improvement.

The game-based behavioral model training effectively develops the work-related soft skills of garment sector workers. This training method can also be used in different industrial contexts. We suggest the following measures in order to achieve this:

1. Create a platform for sharing best practices in game-based training approaches and their application in different industrial contexts.
2. Establish industry-wide forums or networks to encourage knowledge exchange among garment firms, trainers, and policymakers.
3. Establish partnerships between training institutions, providers, industry associations, and garment firms to ensure alignment between training curricula and industry requirements.

By implementing these policy recommendations, stakeholders can enhance the work-related soft skills of garment sector workers in Ethiopia, improve their employability, and contribute to the overall growth and productivity not just of the garment industry but also of other industries as well.

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