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The Impact of Perceived Training Effectiveness on Innovative Work Behavior in Work-Based Learning Programs: A longitudinal Quasi-Experimental Study

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ABSTRACT

This study investigates the relationship between perceived training effectiveness and innovative work behavior within the context of work-based learning programs. Using a separate-sample pretest-posttest quasi-experimental design, the study compared Innovative Work Behavior (IWB) across three groups: (1) a pre-training/control group; (2) a post-training group that filled the survey immediately after the training completion; and (3) a follow-up group that filled the survey after 3-12 months from their training completion. Data from 461 participants (227 pre-training, 126 post-training, and 108 follow-up) were analyzed using ANOVA and correlational methods. Results revealed a statistically significant increase in IWB from pre-training to follow-up, but not pre- and post-training. Additionally, a positive correlation emerged between perceived training effectiveness and IWB at both post-training and follow-up stages. These findings contribute to the understanding of training program effectiveness in enhancing IWB, highlighting the importance of well-designed Work-based Learning (WBL) programs and the potential for delayed behavioral change.

Keywords: Innovative Work Behavior, Perceived Training Effectiveness, Work-based learning.

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1. INTRODUCTION

In businesses, innovation is a critical component of success and a long-term survival strategy (Anderson et al., 2014). Organizations understand that innovation helps them to gain a competitive advantage (Lukes & Stephan, 2017). Organizations devote a sizeable percentage of their financial resources to professional development to obtain a competitive advantage. To stimulate different ideas in daily life, people need to cope with difficult situations, find new solutions to difficulties and learn a wide range of subjects (Adair, 2007). Such innovation training would take much of the organization's time and money (Jehanzeb & Bashir, 2013). Therefore, preparing a future young force to be more innovative in their jobs in the early stage is one way to address this problem.

Training and development are crucial for organizations' survival since they enable businesses to boost service quality, efficiency, and profitability while enhancing organizational performance (Aragon & Valle, 2013). Organizations must regularly assess the outcomes of training, its effectiveness, and its alignment with organizational strategy (Jain et al., 2021) because it demands time, effort, and financial resources (Mohammed Saad & Mat, 2013). The effectiveness of training programs is motivated by evaluation, which identifies potential improvements (Hung, 2010). Understanding the factors contributing to training programs' success or failure is vital given the time and money organizations devote to them (Blume et al., 2010). The Kirkpatrick (1959) measuring model is the most frequently used to assess training. By addressing the part of training that transfers to the workplace, this approach has acquired tremendous appeal in the context of vocational training (Mohammed Saad & Mat, 2013).

Work-based learning (WBL) programs are an excellent example of institutional support and investment in the young workforce. Their training system is expected to encourage innovation through different mechanisms, including promoting multi-skilling and adaptability to facilitate the introduction of new products and processes (Toner, 2011). Indeed, there is a need to investigate further the specific context of WBL programs in industries. In response to this call, the current study primarily aims to empirically investigate the influence of WBL programs on IWB based on human capital theory. As a response to this call, the current study primarily aims to empirically investigate the influence of WBL programs on IWB based on human capital theory. The novelty of this research stands in contrast to other studies' responses to the above research gap, which is addressed in the study's research question: "Do work-based learning (WBL) programs improve innovative work behavior (IWB)?"

2. LITRATURE REVIEW

According to Scott and Bruce (1994), IWB is the process of producing ideas that people implement as solutions to issues, forming coalitions to support ideas, and implementing ideas into models that are presented to meet the demands of innovation in their environment. Moreover, Janssen (2000) defined IWB as individual behavior that leads to the initiation, presentation, and realization of new ideas, products, or procedures in the workplace, team, or organization. Since then, several studies have used and expanded upon these definitions.

The dimensionality of IWB is a contentious topic in academic literature. One group of researchers argues for a unidimensional conceptualization, suggesting that IWB should be viewed as a single general behavior reflecting an employee's overall propensity to engage in innovation activities (Janssen, 2000). Such simplification allows for easier measurement, facilitating IWB's integration into organizational behavior models. However, this approach risks obscuring the multifaceted processes that characterize the workplace innovation lifecycle and diminishes the explanatory power of more detailed analysis. Alternative scholars propose a multidimensional model in which IWB involves distinct yet interconnected stages, including idea generation, idea promotion, and idea implementation (De Jong & Den Hartog, 2010. This perspective aligns more closely with innovation process theory (West & Farr, 1990) and fosters a nuanced understanding of employee contributions to organizational innovation. By clarifying the construct, researchers can identify which human resource practices or contextual factors most effectively support specific phases of innovation and develop more targeted and effective interventions.

Overall, empirical evidence regarding the dimensionality of IWB is inconclusive. A few studies have established strong intercorrelations among the dimensions, supporting a unidimensional model (Janssen, 2000). However, other studies have demonstrated that these dimensions function autonomously and have different antecedents (Messmann & Mulder, 2012). Thus, we argue that resolving the dimensionality of IWB is essential for ensuring both research rigor and managerial relevance in innovation-focused human resource management systems.

Moreover, numerous studies have demonstrated the relevance of training in improving employees' knowledge and abilities (Jehanzeb, 2021). Becker's (1964) theory of human capital holds that providing significant knowledge and skills to a company's personnel boosts its effectiveness. Therefore, a training program is required whenever a gap exists between personnel's desired and actual performance. Work-based learning is widely acknowledged as necessary for developing professional competence, which is crucial for addressing skills gaps (Palermo et al., 2015). The widely accepted definition of work-based learning, as offered by Seagraves et al. (1996, p. 6), is "learning for work, learning at work, and learning through work." This definition encapsulates the multifaceted nature of work-based learning, emphasizing that learning occurs in preparation for work, during the course of work, and as a result of work experiences. Based on the research literature, WBL encompasses a variety of educational activities, including internships, apprenticeships, and on-the-job training, that integrate academic learning with practical work experience Louw & Katznelson, 2019).

Human capital theory plays a significant role in the relationship between IWB and training effectiveness. Human capital theory, initially formulated by Becker (1962) and Rosen (1976), argues that individual workers have a set of skills or abilities that they can improve or accumulate through training and education. Workplace learning can help individuals equip themselves with the necessary knowledge and skills to implement a new idea in their work setting, contributing to each stage of bringing innovations in work settings (Shah et al., 2022).

In summary, Human Capital Theory suggests that training effectiveness can foster IWB by improving the competencies of individuals and enabling them to produce positive job outcomes. WBL can help individuals equip themselves with the necessary knowledge and skills to implement a new idea in their work setting, contributing to each stage of bringing innovations in work settings.

Hypothesis 1: Participants involved in WBL programs will report higher levels of IWB.
Hypothesis 2: Participants' perception of training effectiveness has a significant relationship with IWB.

3. METHDOLOGY

3.1 Research Design and Rationale:

This study employed a separate-sample pretest-posttest quasi-experimental design (Campbell & Stanley, 2015). Contrary to Campbell and Stanley's (2015) claim that the research design is a true experimental design using equivalent samples that are assigned at random, the samples used in this study were not randomly assigned; rather, they were convenience samples that were available during the pre-test and post-test periods. Due to the non-random assignment of participants, this study employed a quasi-experimental design with non-equivalent groups. This approach aligns with similar past research using Non-equivalent Groups Designs (NEGD) (Baseer et al., 2020; Gao et al., 2022). The investigation involved three groups: (1) a pre-training or control group that completed just the IWB survey before undergoing WBL programs (pre-training), (2) the first experimental group that just completed WBL programs before filling out the survey (post-training), and (3) the second experimental group that completed WBL programs in the prior three to twelve months before filling out the survey (follow-up). This, in turn, provides temporal precedence, an essential criterion for causal inference (Podsakoff et al., 2012), by measuring IWB pre- and post-WBL so researchers can link the behavior changes to the intervention. For instance, if post-test and follow-up groups exhibit significantly higher IWB, this strengthens claims about WBL's efficacy (Schiemer, 2024).

3.2 Data Collection Procedures

The study targeted graduates who were engaged in WBL programs at the time of data collection. Survey instruments were used and developed based on validated measures from prior research. Since human subjects were involved in this study, approval was sought from the Ethics Committee at Sultan Qaboos University before collecting the data. Moreover, the online data did not proceed without respondents' agreement to an ethics note stating, for example, anonymity, voluntariness, and data protection issues.

3.3 Participants

A pre-test, post-test, and follow-up quasi-experimental study was conducted, including three groups with baseline data, post-test, and follow-up assessment data. The study targeted the young workforce involved in WBL programs in three different stages immediately after their graduation, upon their completion of the training intervention, and finally after 3-12 months from their training completion.

The pre-training, post-training, and follow-up program efficacy analysis indicates that potential selection bias and group equivalence issues have been adequately addressed. Though with a strongly significant Levene's test for homogeneity of variances value (p=0.002), the group standard deviations were pretty close (pre-training: 1.05, post-training: 0.84, follow-up: 0.82), and therefore variance differences are not likely to undermine the validity of the ANOVA outcomes (Horst et al., 2022). One-way ANOVA revealed significant differences in IWB means between the three stages (F=4.702, p=0.010), and Dunnett's T3 post-hoc test revealed a significant difference in means between pre-training and follow-up (0.34, p=0.005), and this revealed evidence for the intervention's effectiveness (see Table 1). Despite not applying random assignment, group equivalence was guaranteed by having large sample sizes (pre-training: 227, post-training: 126, follow-up: 108), which helped limit sampling bias. The boost in the group means that was found (pre-training: 5.53, post-training: 5.67, follow-up: 5.86) indicates desired program outcomes and not selection bias (Hilligoss & Rieh, 2008). Overall, notwithstanding concerns about selection bias, positive outcomes make up for the research design and indicate that differences in IWB are due to the training intervention and not pre-intervention between-group differences.

Table 1: One-Way ANOVA Results – IWB vs. Training Stages

					Tests of Homogeneity of Variances		**ANOVA**	
		N	Mean	Std. Deviation	Levene's Statistic	Sig.	F	Sig.
IWB	pre-training	227	5.5260	1.04846				
	post-training	126	5.6667	.84057				
	follow-up	108	5.8630	.82333				
	Total	461	5.6434	.95290	6.303	.002	4.702	.010

Group Differences

		Mean Difference	Sig.	95% Confidence Interval (LO – UB)	
	Dunnett's T3 Test				
IWB	Pre-training - post-training	-.1407	.427	-.3861	.1047
	Post-training - follow-up	-.1963	.203	-.4585	.0659
	Pre-training - follow-up	-.33697*	.005	-.5903	-.0836

* The mean difference is significant at the 0.05 level.

3.4 Measures

3.4.1 Innovative Work Behavior:

The research assesses Innovative Work Behavior (IWB) using the 10-item scale developed by De Jong and Den Hartog (2010), which measures an individual's innovative behavior at work across four dimensions: idea exploration, idea generation, idea championing, and implementation. For this study, the scale was adapted based on Alt et al. (2022), achieving a reliability coefficient of Cronbach's Alpha at 0.88, and modified to include aspects of innovative behavior in academia on a 7-point scale. While traditionally viewed as a four-dimensional construct, this research conceptualizes IWB as a one-dimensional construct encompassing all four stages of innovation. Supporting studies indicate that a one-factor model may offer better fit indices (Bos-Nehles & Veenendaal, 2019; Dahiya & Raghuvanshi, 2022), reinforcing the validity of the scale's structure for this study.

3.4.2 Perceived Training Effectiveness:

Grohmann and Kauffeld (2013) developed and validated a concise Questionnaire for Professional Training Evaluation (Q4TE) that measures both short- and long-term training outcomes based on a six-factor model. This model includes short-term outcomes such as satisfaction, perceived utility, and knowledge, as well as long-term outcomes like application to practice, organizational individual results, and global results. For this study, the training evaluation measure from Sawrikar et al. (2021) was adopted to assess perceived training effectiveness (PTE) at the post-training stage.

This measure consists of 6 items focused on short-term outcomes (two for each factor) and includes additional items for overall satisfaction and intention to use the training. For the follow-up stage, a 6-item measure for long-term outcomes was also utilized, focusing on behavior, individual, and global results.

3.5 Data analysis

The researchers analyzed the collected data using SPSS, examining participant details like gender and experience, and checking for normal distribution of the data. They compared measurements from the intervention and control groups, calculating mean scores, standard error, and confidence intervals for numerical data, while using frequencies and percentages for categorical variables. Chi-square tests were employed for significant group differences, and Analysis of Variance (ANOVA) was used to compare mean scores among the three groups to verify hypothesis 1. A statistical significance level was set at a two-tailed p-value below 0.05. For hypothesis 2, the AMOS program was utilized for Structural Equation Modeling (SEM) to explore relationships among variables and assess theoretical frameworks and causal pathways.

4. RESULTS

The final sample size after data screening was N = 461 (227 pre-training, 126 post-training, and 108 follow-up). Respondents consisted of male (n = 277, 59.6%) and female (n = 188, 40.4%). In the pre-training stage, there were (n = 127, 55.9%) males and (n =100, 44.1%) females. In the post-training stage, there were (n = 90, 71,4%) males and (n = 36, 28.6%) females. In the Follow-up stage, there were (n = 59, 54.6%) males and (n = 49, 45.4%) females.

4.1 Exploratory Factor Analysis

To assess the dimensionality and item reduction of 37 study indicators (23 in pre-training, 31 in post-training, and 29 in follow-up), a series of EFAs were performed through IBM SPSS using Principal Axis Factoring (PAF) analysis with the Oblique Rotation (Oblimin) method.

Additionally, items that did not adhere to the 60/40 rule for item inclusion were removed. With no cross-loadings of .40 or higher, only items with a loading of at least 60 were included. In the rare instance where a factor loading was marginal below 60 and retaining the item would have preserved the measure's content validity, the item was kept. The eigenvalue scores and the scree plot were used to calculate the number of factors. A factor was kept if its eigenvalue score was higher than 1. In Pre-training and Post-training studies, it was used fixed number of factors for extraction (Pre-training = 4 and Post-training = 5).

During EFA, a set of steps was used. Any item that does not match the aforementioned inclusion requirements was deleted. It was ensured that the removal of any item wouldn't compromise the scale's content validity before doing so. This method was done in an iterative process. One at a time, items with poor loading were removed, and an updated EFA was then executed. The final factor structure was achieved by using this iterative procedure.

4.2 Initial Item Reduction

By reducing factor loadings smaller than 0.3, it can be reached a more insightful answer, as suggested by Onraet et al. (2011). The removal of any item with all scores suppressed is recommended. According to Guadagnoli and Velicer (1988), scores higher than 0.4 are regarded as steady. Items should not cross-load too highly between factors (measured by the ratio of loadings being greater than 75%). Moreover, it is recommended to run exploratory factor analysis (EFA) on all scales together in SPSS to identify underlying constructs, enhance analysis power, and compare factor loadings (Trendafilov & Hirose, 2023). Additionally, following Trendafilov and Hirose (2023), all scales were analyzed together in EFA to identify underlying constructs, boost analysis power, and compare factor loadings. Addressing potential issues like multicollinearity and sample size (Mamouei et al., 2022) was crucial. The process of scale purification in this initial stage reduced the number of items. The final loadings of these indicators are displayed in Table 2, and as can be seen, factor one IWB was comprised of 5 items, Intrinsic Motivation 4 items, Creative Self-efficacy 4 items, Openness to Experience 2 items, Post-training PTE 8 items and Follow-up PTE 5 items.

Table 2: Rotated Pattern Matrix of Exploratory Factor Analysis

	Pre-training stage		Post-training stage		Follow-up stage	
	IWB	**PTE**	**IWB**	**PTE**	**IWB**	**PTE**
championing1	.724		.433		.685	
championing2	.783		.752		.527	
implement1	.843		.662		.683	
implement2	.801		.829		.638	
implement3	.781		.507		.538	
satisfaction1		n/a		.716		n/a
satisfaction2		n/a		.675		n/a
utility1		n/a		.814		n/a
utility2		n/a		.841		n/a
knowledge1		n/a		.846		n/a
knowledge2		n/a		.850		n/a
expBehavior1		n/a		.750		n/a
expBehavior2		n/a		.674		n/a
behavior2		n/a		n/a		-.902
individual1		n/a		n/a		-.832
individual2		n/a		n/a		-.771
global1		n/a		n/a		-.850
global2		n/a		n/a		-.719

Note: IWB = Innovative Work Behavior, PTE = Perceived Training Effectiveness, n/a = Not applicable

In sum, the two final components were IWB (championing1, championing2, implement1, implement2, and implement3), PTE in post-training stage (satisfaction1, satisfaction2, utlity1, utlity2, knowledge1, knowledge2, expBehavior1, and expBehavior2), and PTE in follow-up stage (behavior2, individual1, individual2, global1, and global1). The final list of indicators is reported in Table 3.

Table 3: Final List of Items for the 3 Measures Components

IWB	
Variable Name	**Item**
championing1	How often do you make important organizational members enthusiastic about innovative ideas?
championing2	How often do you attempt to convince people to support an innovative idea?
implement1	How often do you systematically introduce innovative ideas into work practice?
Implement2	How often do you contribute to the implementation of new ideas?
Implement3	How often do you put effort into the development of new things?

Perceived Training Effectiveness (Post-training)		Perceived Training Effectiveness (Follow-up)	
Variable Name	**Item**	**Variable Name**	**Item**
satisfaction1	I will keep the training in good memory	behavior2	In my everyday work, I often use the knowledge I gained in the training.
satisfaction2	I enjoyed the training very much	individual1	I successfully manage to apply the training contents in my everyday work.
utility1	The training is very beneficial to my work	individual2	Since the training, I have been more content with my work.
utility2	Participation in this kind of training is very useful for my job (in future)	global1	My job performance has improved through the application of the training contents
knowledge1	After the training, I know substantially more about the training contents than before	global2	Overall, it seems to me that the application of the training contents has facilitated the work flow in my company.
knowledge2	I learned a lot of new things in the training		
expBehavior1	Overall, I am satisfied with the training		
expBehavior2	I intend to use the knowledge I gained in the training in my everyday work		

4.3 Internal Consistency

Before performing the reliability analysis in SPSS, each of the two factors was examined for unidimensionality using Factor Analysis with eigenvalue scores greater than 1 for each scale. Both scales showed unidimensionality of structure when each scale was factor analyzed independently. Table 4 provides the factor analysis for each scale, indicating the Kaiser-Meyer-Olkin (KMO) Measure and total variance explained by the unidimensional factor.

The KMO measures the sampling suitability, which means whether the responses given with the sample are adequate or not. It should be more than 0.5 for a satisfactory factor analysis to continue. Kaiser (1974) recommends 0.5 (value for KMO) as a minimum (barely accepted), values between 0.7-0.8 are acceptable, and values above 0.9 are excellent. For the four main factors, KMO ranged from .756 to .885, except for the Openness to Experience factor, where the KMO was fixed at .500. The total variance is all 60% or above, except for IWB in the follow-up stage with 59.30%. Hinkin (1998) argued that 60 per cent should be a minimum value of the percentage of explained variance. According to Hair Jr et al. (2021), it is common to consider a solution that accounts for 60 per cent of the total variance as satisfactory, and in some cases even less, in the social sciences, where information is frequently less precise. Therefore, the author was cautioned to further delete any item to improve the unidimensionality test, especially since the reference variance of IWB in the follow-up stage is very close to the recommended threshold (60%).

Table 4: Testing Unidimensionality of Scales across 3 Stages

		Pre-training		**Post-training**		**Follow-up**	
Item	**No. of items**	**KMO Measure**	**% of Variance**	**KMO Measure**	**% of Variance**	**KMO Measure**	**% of Variance**
IWB	5	.843	70.08	.856	64.13	.821	59.05
Perceived Training Evaluation	8 Post- 5 Follow-	n/a	n/a	.885	64.75	.869	75.47

Note: All factor loadings for each scale were .6 and above except with IWB in the follow-up stage and Openness to Experience in the pre-training stage

4.4 Normality and Reliability

Reliability was assessed using Cronbach's alpha (Cronbach, 1951). Before performing the reliability analysis in SPSS, each of the two factors was examined for unidimensionality using Factor Analysis with eigenvalue scores greater than 1 for each scale. Both scales showed unidimensionality of structure when each scale was factor analyzed independently. Table 5 provides the descriptive statistics (M, SD, skewness, and kurtosis), Cronbach's alpha (α), and McDonald's Omega (ω) of both factors.

All relevant variables' normality was checked. There was no SD lower than 0.7. The skewness and kurtosis were also examined. The skewness data were divided by their standard errors of skewness before performing the t-test. The researcher then used the essential t-value of 3.30 or the $p < .001$ suggested by Tabachnick et al. (2013) to assess if the components were statistically significant. A similar method was used for kurtosis. The kurtosis data were divided by their standard errors of kurtosis to create a t-test. The cutoff levels for the skewness test were used as well. This test for normality showed that the notion of normalcy was flawed. The majority of variables have some skewness and/or kurtosis at the univariate level. In research with surveys that use multiple Likert-scale questions, Cronbach's alpha is the go-to method for assessing the scale's reliability before further analysis (Tavakol & Dennick, 2011). In this study, the value of both Cronbach's alpha (α) and McDonald Omega (ω) was above .80. According to Kalkbrenner (2023), an omega value of 0.80 or higher indicates strong reliability.

Table 5: Descriptive Statistics of Scales

Item	Mean (SD)	α Cronbach's alpha	ω McDonald Omega	Skewness	Kurtosis
Pre-training stage (N = 227)					
IWB	5.51 (.85)	.892	.893	-.34	-.49
Perceived Training Effectiveness	n/a	n/a	n/a	n/a	n/a
Post-training stage (N = 126)					
IWB	5.67 (.70)	.859	.861	-.22	-.57
Perceived Training Effectiveness	6.12 (.85)	.917	.916	-.89	.00
Follow-up stage (N = 108)					
IWB	5.86 (.82)	.824	.825	-.43	-.21
Perceived Training Effectiveness	5.68 (1.11)	.917	.921	-.81	.76

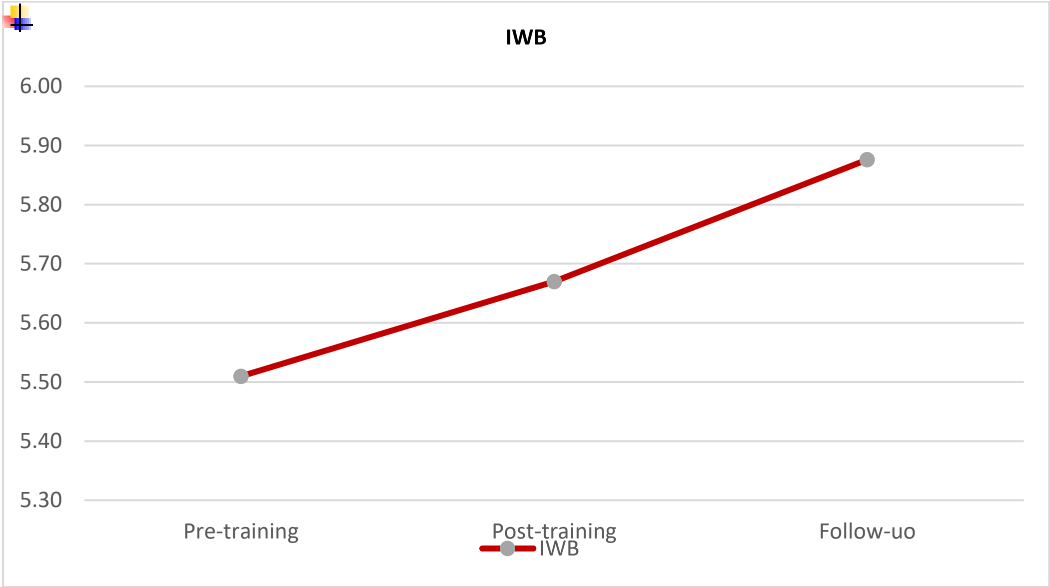
***Note**:* n/a = Not applicable

4.5 Results of Research Questions and Hypotheses:

Hypothesis 1: Participants involved in WBL programs will report higher levels of IWB.

The study further explored a test of means. A graph showing the movement of the mean of the IWB is presented across the three stages. The graph in Figure 1 shows changes in mean values over the three stages of study: pre-training, post-training, and follow-up stages. There was an improvement in the IWB across the three groups (pre-training, post-training, and follow-up).

Figure 1: Estimated Means over Training Stages



In this research, we utilized one-way analysis of variance (ANOVA) for comparisons across groups based on values (Field, 2024). The process tests the null hypothesis that all groups share the same mean value. If differences are found, then at least one group mean is distinct. To explore these differences, we employed Dunnett's T3 test, which compares treatment groups to a single control group efficiently (Dunnett, 1955). We specifically employed ANOVA to determine the relationship between innovative work behavior (IWB) scales and various levels of training. Participants were divided into three training stages (Pre-training stage, Post-training stage, and Follow-up stage). The ANOVA suggested that the IWB ($F_{2, 458} = 4.702$, $p = .010$) scores of the training stages differ significantly.

Since Levene's Statistic was significant for IWB ($p = .002$), the equal variance of these scales was not assumed. To check for individual differences between groups, post-hoc comparisons were assessed using Dunnett's T3. The test indicated that the mean score for Follow-up participants (IWB M = 5.8630, SD = .82333) differed significantly from Pre-training participants (IWB M = 5.5260, SD = 1.04846), supporting H1. However, no significant differences were detected for IWB between Pre-training and Post-training participants. Table 6 summarizes the One-way ANOVA results.

Table 6: One-Way ANOVA Results – Training Stages

					Tests of Homogeneity of Variances		**ANOVA**	
		N	Mean	Std. Deviation	Levene's Statistic	Sig.	F	Sig.
IWB	pre-training	227	5.5260	1.04846				
	post-training	126	5.6667	.84057				
	follow-up	108	5.8630	.82333				
	Total	461	5.6434	.95290	6.303	.002	4.702	.010

Group Differences

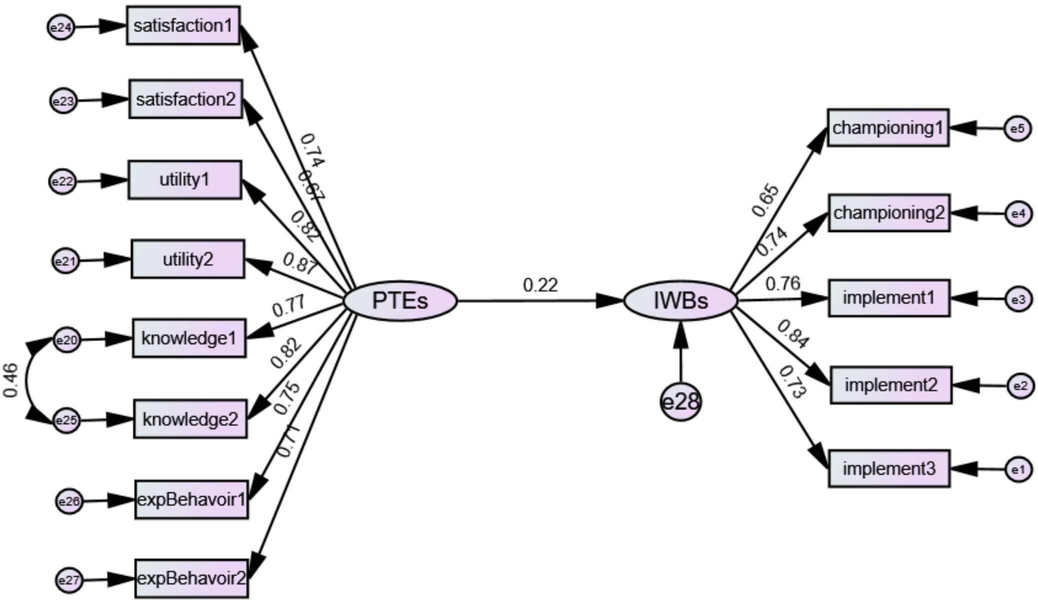
		Mean Difference	Sig.	95% Confidence Interval (LO – UB)	
Dunnett's T3 Test					
IWB	Pre-training - post-training	-.1407	.427	-.3861	.1047
	Post-training - follow-up	-.1963	.203	-.4585	.0659
	Pre-training - follow-up	-.3370*	.005	-.5903	-.0836

* The mean difference is significant at the 0.05 level.

Hypothesis 2: Participants' perception of training effectiveness has a significant relationship with IWB.

To establish nomological validity, the information pertinent to the study hypotheses was examined. A structural equation model generated through AMOS was used to test the direct relationship between PTE and IWB (Figure.2). Starting with the Post-training stage, the fit indices for the model fell within the acceptable range: CMIN/df = 1.72; TLI = .94; CFI =.95; RMSEA = .076 (CI = .051–.010); and SRMR = .057. The study assessed the impact of PTE on IWB. The impact of PTE on IWB was positive and significant (b = .22, t = 2.16, p = .03), supporting H2.

Figure 2: Post-training stage Structural Equation Model
of the direct effect between PTE and IWB



The fit indices for the structural equation model in the Follow-up stage also fell within the acceptable range: CMIN/df = 1.56; TLI = .96; CFI =.97; RMSEA = .072 (CI = .029–.109); and SRMR = .053. The study assessed the impact of PTE on IWB (Figure 3). The impact of PTE on IWB was positive and significant (b = .46, t = 4.00, p < .001), supporting H2. The results are presented in Table 7.

Figure 3: Follow-up stage Structural Equation Model of direct effect between PTE and IWB

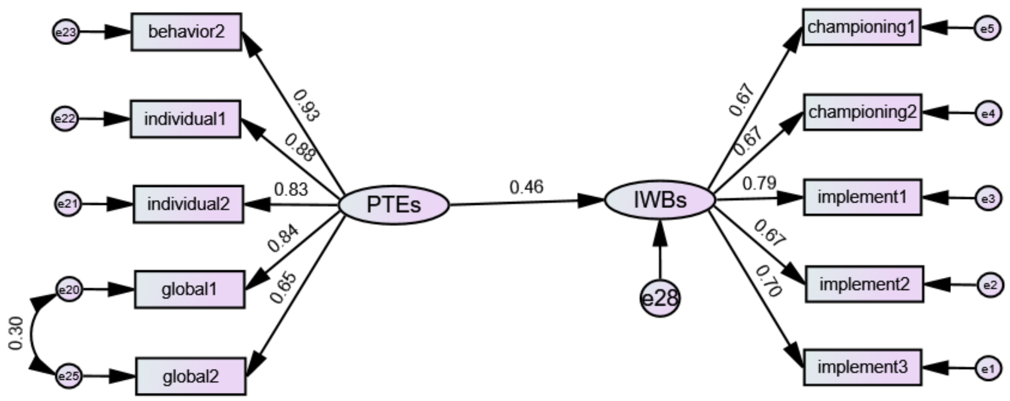


Table. 7: Relationship Analysis Summary / IV – DV Direct Relationship

Hypothesized Relationship	Standardized Estimates	t-value	p-value	Decision
Post-training stage				
PTE --> IWB	.219	2.164	.030	Significant
Follow-up stage				
PTE --> IWB	.456	4.00	***	Significant

***P ≤ 0.001

5. DISCUSSION

The main purpose of this study was to find an answer to the research's main question and test two hypotheses. The first hypothesis investigates the impact of WBL programs on the levels of IWB. In this study, we monitored the changes and improvement in IWB over the study's three stages: pre-training, post-training, and follow-up. Interpreting the finding highlights two important implications. First, significant changes were observed in IWB over time. However, it may take a longer period, as it was just significant from pre-training to the follow-up stage. More importantly, the findings indicate that training intervention in the context of WBL was effective in the modification of innovative behavior.

The second hypothesis analyzed the impact of training effectiveness on IWB in the context of WBL programs and suggested that participants involved in WBL programs will report higher levels of IWB. The findings are consistent with those of Dostie (2018), who suggested that training programs have been shown to have a positive impact on promoting IWB among employees. It also aligned with numerous studies that demonstrated the relevance of training in improving employees' knowledge and abilities (Bos-Nehles & Veenendaal, 2019; Jehanzeb, 2021). The findings also support the importance of WBL as a pre-intervention tool in bridging the gap between academic learning and labor market demands (Leary & Sherlock, 2020). WBL has been shown to act as a bridge between knowledge and action or behavior in the workplace, enabling employees to effectively apply their knowledge (Longmore, 2011). In summary, the correlational analysis provides evidence of a positive association between PTE and IWB in the context of WBL programs. These findings contribute to the existing body of literature on the impact of training programs and WBL on employees' IWB, emphasizing the importance of effective training and WBL programs in promoting innovative behavior in the workplace.

While this study revolved around the research's main question, the results yield wider insights, leading to a critical discussion on (a) whether IWB can be treated as a unidimensional construct, (b) the potential delayed training effects between pre-training and follow-up phases, and (c) explanations for post-intervention increases in IWB. The uni-dimensionality of IWB as a higher-order construct of the original study's findings strongly indicates the alignment with the original research. In particular, recent studies (e.g., Atitumpong and Badir, 2018; Niesen *et al*., 2018) determined IWB as a unidimensional factor. Such findings contribute to ongoing theoretical debates about the dimensionality of IWB (De Jong & Den Hartog, 2010; Janssen, 2000). In particular, we theoretically describe and empirically test that IWB functions as an integrated behavioral construct. Consequently, our contribution bolsters the generalizability of recent unidimensional models. We contend that this distinction seeks additional theoretical elaboration in future work.

The apparent lagged effect of treatment exposure in those who demonstrated significantly stronger IWB scores at the follow-up stage as compared to the pre-training stage, in contrast with the immediate effects post-training found very limited differences, suggests a potential delay in the implementation of learnt skills in practice, thus reflecting the often complexity of behavioral transfer in WBL contexts. Such a phenomenon is consistent with theoretical perspectives that highlight the temporal nature of learning transfer and behavior change. In fact, the transfer of training literature suggests that the immediate transfer is seldom instantaneous, but rather happens over time through reinforcement, the opportunity to apply new knowledge, and organizational encouragement (Blume et al., 2010b). Kirkpatrick's (1996) evaluation model further distinguishes between short-term cognitive gains—captured post-training—and sustained behavioral changes, which necessitate time for skill internalization and contextual adaptation. Participants likely required the follow-up period to reconcile training content with existing workflows, test concepts in practice, and garner organizational support—processes amplified by social cognitive theory (Bandura, 1986), wherein observational learning and self-efficacy reinforce adaptive behaviors.

Wallas' (1926) creativity stages, particularly the incubation phase, further suggest that subconscious processing and environmental stimuli during the follow-up period may have refined trainees' innovative strategies. This phenomenon illustrates an important aspect of organizational ecosystems: WBL outcomes emerge from the interactions between the autonomy of individuals and contextual factors (Kluge & Gronau, 2018). Accordingly, even if post-training assessments are biased against long-term efficacy, the results call for longitudinal frameworks to reconcile the intricate interplay between elements of training, workplace ecosystems, and emergent behaviors. The postponement of IWB enhancements also introduces alternative explanations, including workplace experience, organizational dynamics, and temporal contextual shifts. While the training intervention likely served as a catalyst, workplace experience accumulated post-training—such as exposure to real-world challenges and peer collaboration—may have enabled skill refinement through experiential learning cycles (Decius et al., 2021). Concurrently, evolving organizational factors, such as enhanced psychological safety (Edmondson & Lei, 2014) or leadership endorsement of experimentation (Amabile et al., 1996), could have synergized with training to create a climate conducive to risk-taking. Temporal shifts in organizational priorities, resource allocation, or team composition during the follow-up phase may have further compelled trainees to apply skills in novel contexts (Hammond et al., 2011). Additionally, self-determination theory (Gagné & Deci, 2005) suggests that intrinsic motivation, cultivated through autonomy and mastery experiences, may have gradually replaced initial extrinsic compliance, while social networks achieving critical mass in adopting innovative practices (Zhou & George, 2001) could have normalized IWB by follow-up. These mechanisms position training not as a standalone driver but as one node within a broader developmental ecosystem, where workplace dynamics mediate its long-term impacts. While maturation effects (e.g., role tenure) cannot be entirely discounted, the phased emergence of IWB aligns most parsimoniously with the confluence of training, contextual reinforcement, and individual adaptation.

Thus, this study emphasizes the importance of the temporal and contextual dimensions of WBL interventions. Asserting the strategic role of training within complex systems, the results elaborate a nuanced articulation of the constituents of innovation competencies—an articulation necessary to implement antecedents that close the learning-doing gap. Longitudinal approaches, coupled with systemic support structures, are pivotal for nurturing sustainable behavioral change in complex organizational environments.

6. PRACTICAL RECOMMENDATIONS

This study highlights the significance of setting and timing in the effectiveness of WBL interventions in facilitating IWB. IWB can flourish after training in advanced organizational contexts, so practitioners should employ experiential learning theory-based interventions. Firstly, WBL programmes must be structured into extended phases: foundation training, guided practice, and independent experimentation. This corroborates the models, emphasizing the importance of time for skills integration and behaviour change. Secondly, immediately applying skills to the real-world following training is essential. Job-embedded projects, like solving organizational issues within a month of training, can effectively ground theoretical knowledge in practice, with formal peer review to solidify learning. By tracking innovation metrics over time, there will be concrete evidence of improvement. Thirdly, continuous feedback loops are necessary to customize programs to evolving workplace contexts. Regular surveys can measure contextual factors, facilitating timely revision according to team feedback. Lastly, trying IWB development for career advancement enhances long-term engagement. Recognition of innovation milestones through micro-credentials or performance evaluation illustrates organizational commitment to innovation capacity building.

7. CONCLUSION

The paper makes several contributions to the literature on IWB. It has several implications from both a theoretical and empirical standpoint, besides practical implications. Firstly, the positive correlation between PTE and IWB in this study suggests that positive PTE for individuals involved in WBL programs leads to increased IWB. This finding aligns with previous research on the role of training programs in the workplace and has significant implications for the development of training interventions aimed at boosting IWB. It contributes to the existing body of literature on the impact of training programs and WBL on employees' IWB, emphasizing the importance of effective training and WBL programs in promoting innovative behavior in the workplace.

The empirical contribution of this study extends beyond theoretical implications to enrich the literature with several significant empirical implications. The study demonstrates that WBL serves as an effective intervention tool for promoting IWB over time. The research also indicates that individuals take longer to change their IWB, highlighting the critical importance of extending research periods in future studies to investigate modifications in innovative behavior.

Several practical implications emerged from the study that provide useful information in furthering the development and promotion of IWB through effective training programs, as well as adding to the existing body of knowledge on IWB, including the design and implementation of effective training programs. The design and implementation of effective training programs are not merely avenues for theoretical understanding; they represent powerful tools for unlocking tangible, practical benefits for individuals and organizations alike. This paper delves into two key contributions of well-crafted training interventions, highlighting their potent impact on both individual skill development and organizational performance improvement through the lens of enhanced IWB.

8. LIMITATIONS AND FUTURE RESEARCH

This study acknowledges its limitations due to the time constraints, which rendered the utilization of a proposed pre-experimental design unattainable. The researcher resorted to the use of a separate-sample pretest-posttest quasi-experimental design. While quasi-experiments can provide data regarding causal relationships, since they are not randomized, they can lead to selection bias and make causality less easy to determine. Quasi-experiments are nevertheless applicable where true experiments cannot be conducted. To aid future research for validity, the study recommends mixed methods involving quantitative and qualitative data and replication in larger or different populations to improve the generalizability and strength of findings.

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