

Effects of BEEF and Drill Training on Movement Comfort and Free Throw Accuracy in PGRI High School Basketball Extracurricular Players

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Abstract

Free-throw shooting is one of the most essential skills in basketball, requiring proper shooting technique and optimal movement comfort to achieve consistent performance. Preliminary observations at SMA PGRI 1 Pati indicated that the free-throw accuracy of students participating in the basketball extracurricular program was relatively low, highlighting the need for effective training methods. This study aimed to examine the effects of the BEEF and Drill training methods on movement comfort and free-throw shooting accuracy. A quantitative quasi-experimental design with a pretest–posttest approach was employed. Ten basketball extracurricular participants were selected using purposive sampling and assigned to either the BEEF or Drill training group. The research instruments included a free-throw accuracy test, the Physical Activity Enjoyment Scale (PACES) questionnaire to assess movement comfort, an observation sheet, and a training monitoring sheet. Data were analyzed using IBM SPSS Statistics through the Shapiro–Wilk normality test, Levene’s test for homogeneity of variance, and the paired-samples t-test. The results showed that the BEEF training method significantly improved movement comfort ($p = 0.020$) and free-throw accuracy ($p = 0.049$). Similarly, the Drill training method significantly improved movement comfort ($p = 0.024$) and free-throw accuracy ($p = 0.011$). These findings indicate that both the BEEF and Drill training methods are effective in enhancing movement comfort and free-throw shooting accuracy among high school basketball extracurricular participants. This study provides practical evidence for coaches and physical education teachers in selecting effective training methods to improve basketball shooting performance..

Keywords: BEEF, basketball, drill training, free-throw accuracy, movement comfort.

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1. INTRODUCTION

Basketball is one of the most popular sports taught in schools because it adds to kids' physical fitness, motor development, collaboration, decision-making skill, and character formation through structured physical activities (Irawan & Prastiwi, 2022; Wolch et al., 2021). Since shooting is the only fundamental basketball ability that immediately results in points throughout a game, it is the most crucial offensive tactic. As a result, in order to consistently score, players must become proficient in shooting mechanics.

It's one of the most crucial. It's one of the most unchallenged. Although free throws are performed without defensive pressure, successful execution requires proper body mechanics, balance, coordination, attention, and consistent movement (Nugroho, 2023). Particularly among undergraduates and college students, basketball has grown in popularity as a team activity (Sungkawa & Harwanto, 2020). Technical findings, students' movement, and the technical training program. To create the best release angle and ball trajectory, good free-throw shooting requires coordinated movements of the lower limbs, trunk, shoulders, elbows, wrists, and fingers (Ramsden et al., 2023; Wang & Zhang, 2025). Two teams of five players each compete in basketball. Each team's objective is to score points by placing the ball in the opponent's basket and keeping the other team from doing the same (Cao et al., 2024; Shaabani et al., 2020).

A commissioner, a table official, and a referee oversee the game. Poor coordination or improper shooting techniques may decrease movement efficiency and shooting accuracy. Therefore, choosing the right training approach is crucial to enhancing both movement quality and shooting performance. Students can use this extracurricular activity to express their interests and skills, develop their basketball skills, and learn virtues like self-discipline, sportsmanship, and collaboration (Daro et al., 2026). Many pupils at SMA PGRI 1 Pati showed comparatively poor free-throw accuracy, according to preliminary observations made during basketball extracurricular activities. The majority of participants executed unsuccessful shots due to variable shooting mechanics, unstable body balance, and poor coordination. Movement, technical training program, technical performance, technical findings, technical findings. Consequently, pupils are more evidence-based, free-based training.

Among the training methods commonly applied in basketball coaching, the BEEF (Balance, Eyes, Elbow, and Follow-Through) method and the drill method are widely recognized for improving shooting performance. The efficiency of the methods used is directly correlated with how comfortable one is when moving (Kelmendi et al., 2021; Kozar et al., 1994). By emphasizing body balance, visual focus, elbow alignment, and good follow-through, the BEEF method helps players establish proper shooting mechanics and execute technically effective shooting actions. When it comes to catching up on points, extending a lead, or breaking a deadlock in crucial situations, a player's ability to regularly make shots from the free throw line can give the team a big edge (Ishaq et al., 2020). The drill approach, on the other hand, emphasizes methodical, repeated practice to improve motor learning, movement consistency, and automatic shooting skill execution through constant repetition (Atiq & Selamat Budiyo, 2020). While improving shooting performance is the goal of both approaches, they use different learning concepts and may yield differing results in terms of technical execution and movement quality.

Previous research have indicated positive impacts of both training approaches on basketball shooting performance. (Alamsyah et al., 2022) discovered that by improving appropriate shooting mechanics, the BEEF approach considerably increased high school students'

free-throw accuracy. Similarly, Nugroho (2023) showed that using proper body alignment and follow-through technique, BEEF-based training successfully improved shooting consistency. Additionally, drill training has been shown to enhance shooting accuracy by strengthening motor memory through repeated practice (Atiq & Selamat Budiyo, 2020). Furthermore, (Darisman et al., 2025) reported that structured and targeted sports training effectively enhances technical performance through systematic repetition and progressive practice.

Despite these results, shot accuracy has been the primary measure of training efficacy in earlier research. Few studies have examined movement comfort as a significant outcome of basketball training. Athletes' ease, coordination, stability, and confidence during technical movements are reflected in their movement comfort, which may lead to improved movement efficiency and long-term performance. Additionally, prior studies have typically examined either the drill method or the BEEF method independently, and there are still few direct comparisons between these two training modalities using both shooting accuracy and movement comfort as outcome variables, especially among senior high school basketball extracurricular participants.

This study is novel because it uses a quasi-experimental design with basketball extracurricular participants at SMA PGRI 1 Pati to concurrently compare the efficacy of the BEEF and drill training methods on two outcome variables, namely movement comfort and free-throw shooting accuracy. The aim is to understand the impact of these two training approaches so that a more effective and efficient training program can be developed to enhance the free-throw shooting abilities of high school basketball players (Prebiyanto et al., 2025). This study offers a more thorough evaluation by combining technical performance and movement quality within the same research framework, in contrast to earlier studies that simply assessed shot accuracy or used a single training technique.

By presenting empirical data on the relative efficacy of BEEF and drill training techniques, this study is anticipated to theoretically advance the literature on sports training. Practically, the findings may serve as scientific references for physical education teachers, basketball coaches, and extracurricular instructors in constructing more effective training programs to increase students' free-throw performance and movement quality.

Thus, the purpose of this study is to investigate how movement comfort and free-throw shooting accuracy are affected by the BEEF and drill training techniques among basketball extracurricular players at SMA PGRI 1 Pati. Although there may be variations in their efficacy, it is anticipated that both training techniques greatly increase movement comfort and free-throw shooting accuracy.

2. METHOD

This study used a pre-test–post-test experimental design and a quasi-experimental research methodology in a quantitative manner. The purpose of the study was to determine how two distinct training approaches—the drill training method and the BEEF (Balance, Eyes, Elbow, and Follow-Through) training method—affect the free-throw shooting accuracy and movement comfort of basketball extracurricular participants at SMA PGRI 1 Pati. By employing statistical analysis to compare participant performance before and after the intervention, the efficacy of both training approaches was assessed.

2.1 Participants

Ten kids who actively participated in SMA PGRI 1 Pati's basketball extracurricular program made up the participants. Participants were selected using purposive sampling based on the following inclusion criteria: (1) actively participating in basketball extracurricular activities, (2) possessing basic basketball skills, and (3) being willing to participate throughout the study. Five students were assigned to the BEEF training group and five students to the drill training group after the participants were split equally into two experimental groups. Before the data were collected, permission was obtained from the school administration. All of the following the study's voluntary training objectives.

2.2 Research Design

This study adopted a quasi-experimental pre-test–post-test design involving two experimental groups (Creswell & Creswell, 2022). The first group received the BEEF training method, whereas the second group received the drill training method. Both groups completed pre-test measurements before the intervention and post-test measurements after the intervention. The independent variables in this study were the BEEF training method and the drill training method. The dependent variables were movement comfort and free-throw shooting accuracy.

Table 1.

The following is an illustration of the research design

Group	Pre-test	Treatment	Post-test
Experimental Group 1	O ₁	BEEF Training	O ₂
Experimental Group 2	O ₁	Drill Training	O ₂

Source : Primary Data

Where:

O₁ = Pre-test

O₂ = Post-test

X₁ = BEEF training method

X₂ = Drill training method

2.3 Instruments

In this investigation, two main instruments were used. The first movement was adapted from the physical activity. The questionnaire consisted of 18 paired positive and negative comments designed to assess participants' perceived comfort while completing free-throw shooting. Participants gave answers based on their real-life basketball practice experiences. Higher movement comfort levels were reflected by higher scores.

The second assessment involved ten free-throw tries from the official free-throw line by each participant. The participant's shooting accuracy score was determined by adding up all of their successful shots. The researcher also employed a BEEF observation checklist, which assessed four technical components: balance, eyes, elbow, and follow-through, using a four-point rating scale that ranged from 1 (poor) to 4 (excellent) to guarantee that the intervention was carried out consistently. Throughout the intervention, a training diary was also kept to record attendance,

training length, exercise types, and other pertinent observations made throughout each training session.

2.4 Procedures

Preparation, pre-test, intervention, and post-test were the four successive phases of the study. Participants were divided into two experimental groups, research instruments were produced, and approval from SMA PGRI 1 Pati was secured during the preparation phase. Prior to the intervention, baseline measures were obtained by having each participant complete the free-throw shooting accuracy test and the movement comfort questionnaire.

After the pre-test, the intervention was carried out over three weeks, with four training sessions each week, for a total of twelve training sessions. The BEEF technique, which stressed effective shooting mechanics through body balance, visual focus, elbow alignment, and appropriate follow-through, was used to instruct participants in Experimental Group I. To enhance motor learning and movement consistency, participants in Experimental Group II underwent drill-based instruction that included systematic and repeated free-throw shooting practice.

To guarantee that the treatment methods were applied uniformly for both groups, the researcher oversaw each training session during the intervention. All participants completed the post-test utilizing the identical free-throw shooting accuracy test and movement comfort questionnaire that were used during the pre-test after the intervention period was over. All subjects gave their informed consent prior to the start of the study, and participation was entirely voluntary.

2.5 Data Analysis

The acquired data were analyzed using IBM SPSS Statistics. To summarize the participants' movement comfort and free-throw shooting accuracy ratings, descriptive statistics were first computed. Assumption tests were carried out prior to hypothesis testing. Since there were less than 50 individuals in the sample, the Shapiro-Wilk test was used to assess the normality of the data. Homogeneity of variance between groups was assessed using Levene's test.

The paired-samples t-test was used to compare pre-test and post-test scores within each experimental group in order to assess the efficacy of each training strategy. At $p < 0.05$, statistical significance was determined. The findings of these analyses were used to determine whether the BEEF and drill training techniques significantly enhanced free-throw shooting accuracy and movement comfort among basketball extracurricular participants at SMA PGRI 1 Pati.

3. RESULTS

The research objectives are presented according to the results of this investigation. Before hypothesis testing, the assumptions of normality and homogeneity were checked to determine whether the data met the requirements for parametric statistical analysis. Subsequently, paired-samples t-tests were conducted to evaluate the effects of the BEEF and drill training methods on movement comfort and free-throw shooting accuracy.

Table 2.

Results of the Normality and Homogeneity Test

Variable	Statistical Test	Group	Sig.	Interpretation
Movement Comfort	Shapiro–Wilk	BEEF (Pre-test)	0.421	Normal
Movement Comfort	Shapiro–Wilk	BEEF (Post-test)	0.314	Normal
Movement Comfort	Shapiro–Wilk	Drill (Pre-test)	0.814	Normal
Movement Comfort	Shapiro–Wilk	Drill (Post-test)	0.421	Normal
Shooting Accuracy	Shapiro–Wilk	BEEF (Pre-test)	0.314	Normal
Shooting Accuracy	Shapiro–Wilk	BEEF (Post-test)	0.314	Normal
Shooting Accuracy	Shapiro–Wilk	Drill (Pre-test)	0.135	Normal
Shooting Accuracy	Shapiro–Wilk	Drill (Post-test)	0.814	Normal
Movement Comfort	Levene's Test	Both Groups	0.676	Homogeneous
Shooting Accuracy	Levene's Test	Both Groups	0.713	Homogeneous

Source: Primary Data

The findings of the Shapiro–Wilk test suggested that all pre-test and post-test data for movement comfort and free-throw shooting accuracy were normally distributed because all significant values exceeded 0.05. Additionally, Levene's test revealed significance values higher than 0.05, suggesting that the data satisfied the homogeneity assumption. As a result, parametric statistical tests were deemed suitable for additional examination of the data.

Table 3.

Results of the Paired-Samples t-Test for Movement Comfort

Group	Mean Difference	t	Sig. (2-tailed)	Interpretation
<i>BEEF</i>	-4.400	-3.773	0.020	Significant
<i>Drill</i>	-4.800	-3.539	0.024	Significant

Source: Primary Data

Both training approaches greatly increased individuals' comfort with movement, as seen in Table 2. The BEEF training approach resulted in a mean difference of -4.400 ($t = -3.773$, $p = 0.020$), whereas the drill training method produced a mean difference of -4.800 ($t = -3.539$, $p = 0.024$). The results show that the two training techniques successfully improved movement comfort following the intervention because both p-values were less than 0.05.

Table 4.

Results of the Paired-Samples t-Test for Free-Throw Shooting Accuracy

Group	Sig. (2-tailed)	Interpretation
<i>BEEF</i>	0.049	Significant
<i>Drill</i>	0.011	Significant

Source: Primary Data

Following the use of both training techniques, the paired-samples t-test likewise showed notable increases in free-throw shooting accuracy. Both the drill training method and the BEEF training method produced substantial improvements in participants' shooting accuracy ($p = 0.011$ and 0.049 , respectively). These results show that both training approaches improved the accuracy of free-throw shooting among SMA PGRI 1 Pati basketball extracurricular participants.

4. DISCUSSIONS

The results of this study show that among basketball extracurricular participants at SMA PGRI 1 Pati, both the BEEF and drill training techniques greatly enhanced movement comfort and free-throw shooting accuracy. These results suggest that organized shooting practice improves both technical performance and the consistency and quality of movement during free-throw execution. The improvement seen following the intervention implies that participants can acquire more confident shooting methods and more effective movement patterns through regular training.

The improvement in movement comfort following the BEEF training method can be explained by its emphasis on fundamental shooting mechanics. The BEEF principles—Balance, Eyes, Elbow, and Follow-Through—offer precise technical instructions that help players maintain correct body alignment, enhance postural stability, and perform reliable shooting motions. To increase movement efficiency and improve participants' perceived comfort during practice, proper body placement and movement coordination minimize unnecessary body adjustments while firing. These results are in line with previous research (Betul, 2015; Cao et al., 2024), which found that the BEEF approach helps high school basketball players perform better on free throws and enhances their shooting mechanics.

Similarly, the drill training method significantly improved movement comfort. By continuously performing the same movement patterns, gamers can improve their motor learning through repetitive practice (Pardini, 2021; Yanuar & Sunaryo, 2022). The principles of motor learning state that repeated practice improves coordination between body segments during skill performance, decreases execution errors, and increases movement automaticity. There are a number of ways in which may be found in which may be found in which may be found in this study.

The accuracy of free-throw shots improved significantly after using both training techniques, according to the current study. This result suggests that improving shooting mechanics through the BEEF method and strengthening movement repetition through drill training are equally beneficial for developing accurate free-throw performance. Stable body balance, proper elbow alignment, controlled ball release, and reliable follow-through are all

necessary for accurate free-throw shooting. Therefore, even though they focus on different learning mechanisms, both training approaches help to improve these crucial technical components.

The findings of this study are consistent with previous research conducted by Nugroho (2023), who reported that the BEEF method significantly improved free-throw shooting performance by emphasizing correct shooting mechanics. Likewise, Darisman et al. (2025) concluded that structured and progressive training effectively enhances technical performance by improving movement consistency through repeated practice. The data supporting the efficacy of structured basketball training programs in enhancing teenage players' shooting performance are strengthened by the concordance between the current results and earlier research.

One noteworthy contribution of this study is the inclusion of movement comfort as an extra outcome variable. The current study shows that training success should also be assessed from the standpoint of movement quality, although earlier research has mostly concentrated on shooting accuracy. Long-term skill learning may be enhanced and technical consistency may be facilitated by comfortable and coordinated movement. Consequently, coaches should consider not only performance outcomes but also athletes' movement experience while constructing basketball training programs.

This study has several limitations despite these conclusions. The generalizability of the results was limited by the small sample size and the fact that participants came from just one senior high school. Additionally, because the intervention period was brief, long-term training changes might not have been completely reflected. Future research is therefore encouraged to incorporate larger samples from different schools, prolong the intervention time, and evaluate additional basketball training methods to provide more comprehensive evidence about the development of shooting performance and movement quality.

Overall, the findings indicate that both the BEEF and drill training methods are effective strategies for improving movement comfort and free-throw shooting accuracy among high school basketball extracurricular participants. These findings have practical implications for basketball coaches and physical education teachers in selecting evidence-based training techniques to enhance students' technical performance.

5. CONCLUSIONS

This study showed that among basketball extracurricular participants at SMA PGRI 1 Pati, both the BEEF and drill training approaches considerably increased movement comfort and free-throw shooting accuracy. The results show that structured basketball training improves technical performance and movement quality, whether it emphasizes correct shooting mechanics using the BEEF principles or repetitive practice using the drill approach.

The results add to the body of knowledge by showing that, in addition to shooting accuracy, movement comfort can be regarded as a significant outcome when assessing the efficacy of basketball training techniques. From a practical standpoint, the results provide evidence-based recommendations for physical education teachers and basketball coaches in selecting effective training approaches to improve students' free-throw performance.

The results of this study may not be as broadly applicable due to the relatively small sample size and the participation of only one institution. To obtain more thorough data on the

efficacy of basketball training techniques, future studies are advised to use larger sample sizes, longer intervention durations, and participants with varied characteristics.

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REFERENCES

- Alamsyah, I. R., Mahfud, I., & Aguss, R. M. (2022). Pengaruh latihan shooting dengan metode beeterhadap akurasi free throw siswi ekstrakurikulerbasket smk negeri 4 bandar lampung. *Sport Science and Education Journal*, 3(2). <https://doi.org/10.33365/ssej.v3i2.2218>
- Atiq, A., & Selamat Budiyanto, K. (2020). Analisis latihan keterampilan teknik dasar sepak bola untuk atlet pemula. *Jurnal Pendidikan Jasmani Dan Olahraga*, 4(1), 15–22.
- Betul, B. (2015). The effects of basketball basic skills training on gross motor skills development of female children. *Educational Research and Reviews*, 10(5), 648–653. <https://doi.org/10.5897/ERR2014.2020>
- Cao, S., Liu, J., Wang, Z., & Geok, S. K. (2024). The effects of functional training on physical fitness and skill-related performance among basketball players: a systematic review. *Frontiers in Physiology*, 15. <https://doi.org/10.3389/fphys.2024.1391394>
- Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). Sage Publications.
- Darisman, E. K., Utomo, G. M., & Rosmi, Y. F. (2025). *Improving Badminton Technical and Tactical Skills through Structured and Targeted Training Peningkatan Kemampuan Teknik dan Taktik Bulutangkis melalui Pelatihan yang Terstruktur dan Terarah*. 3(1), 207–213.
- Daro, M. R., Aswim, D., Wahab, M. I., & Maumere, U. M. (2026). *No Title*. 1774–1783.
- Irawan, F. A., & Prastiwi, T. A. S. (2022). Biomechanical analysis of the three-point shoot in basketball: shooting performance . *Journal of Physical Education and Sport*, 22(12), 3003–3008.
- Ishaq, I. M., Januarto, O. B., & Kurniawan, A. W. (2020). *Meningkatkan Teknik Dasar Shooting Free Throw Bolabasket Melalui Metode Drill Variasi Latihan Wall Shooting pada Peserta Ekstrakurikuler Bolabasket Putra SMP*. 2(12), 592–598.
- Kelmendi, D. S., Miftari, F., & Tekin, M. (2021). Kinematic Analysis of the Basketball Free Throw in Preparation Phase of Elite Athletes. *International Journal of Human Movement and Sports Sciences*, 9(6), 1204–1212. <https://doi.org/10.13189/saj.2021.090614>
- Kozar, B., Vaughn, R. E., Whitfield, K. E., Lord, R. H., & Dye, B. (1994). Importance of Free-Throws at Various Stages of Basketball Games. *Perceptual and Motor Skills*, 78(1), 243–248. <https://doi.org/10.2466/pms.1994.78.1.243>

- Nugroho, A. S. (2023). *Pengaruh Latihan Metode Beef Dan Wall Shoot Terhadap Shooting Freethrow*. (November), 1935–1947.
- Pardini, G. C. (2021). Survey kemampuan dribbling, passing, dan shooting dalam permainan bola basket pada tim bola basket putra di SMA Negeri 1 Pabuaran Kabupaten Serang tahun ajaran 2017/2018. *P3M (Jurnal PGSD, Penjaskesrek, PPKN Dan Matematika)*, 2(1), 1–11.
- Prebiyanto, P., Rusdiana, A., Umaran, U., Imanudin, I., Haryono, T., & Ikhwan, I. (2025). Pengaruh Metode Distributed dan Massed Practice terhadap Shooting Free Throw dalam Permainan Bolabasket. *JURNAL PENDIDIKAN OLAHRAGA*, 15(2), 60–65.
- Ramsden, R., Hayman, R., Potrac, P., & Hettinga, F. J. (2023). Sport Participation for People with Disabilities: Exploring the Potential of Reverse Integration and Inclusion through Wheelchair Basketball. *International Journal of Environmental Research and Public Health*, 20(3), 2491. <https://doi.org/10.3390/ijerph20032491>
- Shaabani, F., Naderi, A., Borella, E., & Calmeiro, L. (2020). Does a brief mindfulness intervention counteract the detrimental effects of ego depletion in basketball free throw under pressure? *Sport, Exercise, and Performance Psychology*, 9(2), 197–215. <https://doi.org/10.1037/spy0000201>
- Sungkawa, A. P. L., & Harwanto, H. (2020). Pengaruh Akurasi Jump Shoot Dan Lay Up Shoot Terhadap Ketepatan Hasil Shooting Bola Pada Cabang Olahraga Bola Basket. *Literacy: Jurnal Ilmiah Sosial*, 2(1), 1–7. <https://doi.org/10.53489/jis.v2i1.13>
- Wang, X., & Zhang, Z. (2025). The effect of mindfulness training interventions on free throw performance in basketball players in stressful situations. *Frontiers in Psychology*, 16. <https://doi.org/10.3389/fpsyg.2025.1647698>
- Wolch, N. J., Arthur-Cameselle, J. N., Keeler, L. A., & Suprak, D. N. (2021). The effects of a brief mindfulness intervention on basketball free-throw shooting performance under pressure. *Journal of Applied Sport Psychology*, 33(5), 510–526. <https://doi.org/10.1080/10413200.2020.1720044>
- Yanuar, F., & Sunaryo, A. B. (2022). The Effect of Agility Drill Training on Agility Dribbling Techniques of Young Female Football Players. *JUMORA: Jurnal Moderasi Olahraga*, 2(2), 174–187. <https://doi.org/https://doi.org/10.53863/mor.v2i2.512>