RESEARCH ARTICLE

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Whether the Tabata Training Method and Basic Military Training Had Different Effects on Improving Military Physical Fitness: An Experimental Study

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ABSTRACT

The growth of physical freshness gradually, stratified, and continually so that physical fitness coaching may be implemented might be one of the implementers of the personnel strength coaching function. Particularly in the physical development of Air Force members as a benchmark for carrying out obligations to uphold the sovereignty of the Unitary State of the Republic of Indonesia and obligations as international representatives. A soldier protecting the curse of the Republic of Indonesia must be physically fit to assist with training implementation and promote physical exercise in daily life. The study's sample and population in this study, the frequency of training were divided into two portions, namely three and five times per week, and the Tabata training method and basic military training were both applied. This study was carried out in 2022 at Lanud Adi Soemarmo's Skadron Educator (Skadik) 404 Military Police Corps. The pseudo-experimental method makes use of the 2x2 factorial design. 44 Military Police Corps members, divided into 4 groups of 11 each, made up the sample. The samapta A test, which is a continuous 12-minute run, is used in the military physical fitness exam, provided that the offender receives a 15- to 30-minute rest period and is permitted to drink mineral water after passing the physical fitness test. A. The shuttle run, pull-up, sit-up, and push-up portions of the Samapta B exam are all completed for a total of 60 seconds. Between each test item in the physical fitness B sequence is a five-minute rest break with a predefined time interval. The data were analyzed using bidirectional variance analysis (ANOVA), after which a Tukey test was run with a 0.05 significant level. For the entire data analysis procedure, SPSS software version 25 is employed. The study's findings support the notion that the frequency and mode of exercise used to increase military physical fitness interact. However, further research on psychological, psychosocial, gender, and other factors connected to enhancing military physical fitness are required.

Keywords: basic military training, physical fitness, Tabata.

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I. INTRODUCTION

The TNI members' physical condition is a key factor in the training process. To enable TNI members to operate at a higher level, the physical condition training program must be well-organized, methodical, and focused on enhancing the physical fitness and functional abilities of the body system. The physical state of members provides information for monitoring and enhancement of a TNI member's quality to satisfy the standards of the members' physical state. Systematic planning and exercise regimens should be implemented in conjunction with improving the member's physical condition. The training program aims to enhance members' physical qualities so that they are prepared to uphold the Republic of Indonesia's integrity and so that a member's physical condition is one of the variables that determine how well they perform. Bompa lists strength, endurance, speed, power, flexibility, balance, precision, coordination, agility, and responsiveness as elements of physical fitness (Bompa & Buzzichelli, 2019). The physical state is a collection of elements that cannot be casually divided, either for maintenance or improvement.

To develop Lanud Adi Soemarmo as a Lanud educational operational provider that prioritizes the quality of educational results, the organization will eventually be able to support the implementation of air operations activities and grow interested in aerospace. Mission: To increase the regional potential for aerospace interest through socialization, promotion, and empowerment; to improve educator quality to produce professional, combative, and innovative air force soldiers; and to prepare support for flight operations in the context of conducting air operations.

The trainer has not been effective in performing a training function for the Indonesian Air Force, even though the training is now being provided to members. The coach's expertise continues to dominate the

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training process. Given the nature and characteristics of motion demands that reflect intermittent activity, involving high-intensity (maximum, submaximal, or supramaximal) of short duration and interspersed with short active-passive recovery periods, the Tabata exercise approach for the Air Force seems appropriately applied (Kellmann & Beckmann, 2019). Practitioners or trainers have not yet utilized effective and efficient training approaches, such as HIIT Tabata workouts, to their full potential. As one of the complementing training methods, Tabata training is therefore quite important (Franchini, 2020). To maintain the integrity of the Republic of Indonesia while implementing the Tabata exercise method, it is important to take into account the demands of movement and time. For this reason, it is crucial to be exact when choosing the time structure for the appropriate work period and rest period. This will allow the results to be taken into account when determining physical needs, particularly when enhancing the military Air Force's physical fitness. The reality on the ground, though, is that exercises still mostly pertain to standard military drills and have not yet been expressly tailored to meet the demands of the Air Force's physical requirements.

One of the efforts made by researchers to offer alternative answers to the issue of the Air Force's lack of particular training methods on the challenges stated in the backdrop of the problems above is this experimental research. The number of weekly exercises for the Air Force and the creation of fundamental military and Tabata training methods differ from earlier studies, including Rýzková *et al*., (2018) This study looked at how physical fitness was affected by aqua fitness combined with high-intensity interval training. Based on the findings, we can say that improvements in some somatic, functional, and motor indicators support the efficacy of aqua fitness programs with HIIT; One of the best high-intensity workouts to be used with the intermittent/interval exercise strategy, according to research by; Tabata (2019) is the Tabata exercise. According to this study, performing Tabata exercises with an emphasis on the energy system is one way to increase athletic performance. Exercise, then this study builds on the findings of other studies of metabolic profiles and their impacts. Sports that rely on both aerobic and anaerobic systems, such as show sports, benefit greatly from Tabata exercises; According to Ekström *et al*., (2019) study, applying stability and Tabata interval training to kids as out-of-school therapies may have positive impacts. This study proposes that one way to enhance kids' physical activity in a classroom setting is to prescribe Tabata interval workouts and stability exercises to students in school-based intervention programs.

The relationship between the research and this research plan is relevant, and the renewal of this research may be characterized as follows, according to the findings of tracking the progress of the most recent similar research results: (1) Training characteristics based on the Air Force's requirements for physical fitness; (2) Air Force training regimens using fundamental military exercises and high-intensity interval training (HIIT), as well as training intervals of three and five times per week based on the ratio of rest intervals; (4) Physical fitness at the Military Police Corps Vocational School through the application of basic military and Tabata training methods and the frequency of exercises per week to improve physical fitness, the study will explore scientifically comparing basic military exercises and Tabata takes into consideration the frequency of exercise.

The observations of researchers and Air Force physical trainers revealed phenomena in the form of facts, such as (a) The lack of research on the creation of special exercises simulating the physical demands of the Air Force in preserving the Republic of Indonesia's integrity; and (b) the lack of a specific description of the Air Force's physical fitness profile, necessitating a review. To increase military physical fitness, one is required to perform in-depth scientific investigations through research to assess and characterize the distinctions between basic military training and Tabata as well as the number of workouts per week.

II. METHODS

This study's design was an experimental research design. Experimental research is the only type of study that can be utilized to determine how different therapies affect different people in a controlled environment, claims Sugiyono (2016, p. 11) An experimental methodology using fixed factors, such as military physical fitness, was applied in this investigation. The manipulative variable is the frequency of exercise each week, whereas the free variables are the fundamental military workout method and Tabata. As seen in the accompanying Table I, researchers used a straightforward 2x2 factorial design to streamline the experimental study procedure.

TABLE I: DESIGN FOR A 2X2 FACTORIAL STUDY

Exercise Frequency (B)	Exercise method (A)	
	Basic military exercises (A_1)	Tabata (A_2)
5 times per week (B_1)	A_1B_1	A_2B_1
3 times per week (B_2)	A_1B_2	A_2B_2

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where:
A_1 – Group of basic military exercises
A_2 – Tabata practice group
B_1 – Five times per week of interval training
B_2 – Three times per week of interval training
A_1B_1 – The fundamental military workout methods employ a frequency of 5 times per week for exercises
A_1B_2 – The frequency of workouts is three times per week for the basic military exercise methods group
A_2B_1 – Five times a week, a Tabata exercise group using interval training
A_2B_2 – The Tabata exercise group works out three times a week.

The sample in this study consisted of 44 members of the Air Force Military Police corps. The population in this study consisted of all of the military police corps students at skadik 405 in Lanud Adi Soemarmo, a total of 50 people. A purposive sample was employed as the sampling approach in this study because (1) The Air Force is made up of men (2) The military police corps Skadik 404 (3) and (4) are in good physical and mental condition. Pretesting first, then splitting the sample group into groups A and B using the basic military training method and the Tabata exercise method in each cell is the methodology used to divide the sample group when utilizing ordinal pairing.

The method used to collect data relates to the samapta portion of the Air Force physical fitness test (Mabes, 2019), A test is a continuous 12-minute run under the condition that Following the introduction of the physical fitness After the test is finished, the offender is given a 10–15-minute rest time and is permitted to drink. For male soldiers, the Samapta B test is a pull-up. Do 60 seconds of sit-ups and 60 seconds of push-ups. The physical fitness sequence B's time interval, which has a 5-minute rest period between each test item, should not be reversed. The timing test may be performed in the morning or the evening, and regulations about weather tolerance limits, temperature, and humidity are established based on the findings of WBGT (Wet Build Globe Temperature) measurements (Markas Besar TNI Angkatan Udara, 2019).

This physical fitness test is being implemented to establish common perceptions, unity of attitudes, mindsets, and ways of acting in organizing physical fitness tests on the technical implementation, norms, and ways of assessing physical fitness tests for soldiers, civil servants, and potential soldiers in the Air Force environment to obtain objective and accountable results. Additionally, the physical fitness test is used to determine soldiers, public servants, and potential soldiers who will participate in education, as well as to evaluate and test physical/physical abilities as parameters to gather physical fitness data.

III. RESULT

The findings of this study pertain to the military physical fitness of Military Police Corps members at Skadik 404 Lanud Adi Soemarmo who are trained using basic military training methods (A1), military physical fitness of Military Police Corps members at Skadik 404 Lanud Adi Soemarmo who are trained by training methods Tabata (B1), physical fitness with a frequency of exercise 3 times per week (B2), physical fitness with a frequency of exercise 5 times per week who are trained using basic military training methods (A_1B_1), physical fitness with a training frequency of 3 times per week trained using the basic military training method (A_1B_2), physical fitness with a training frequency of 5 times per week trained using the Tabata training method (A_2B_1), and physical fitness with a training frequency of 3 times per week trained using the Tabata training method (A_2B_2). The average value and standard deviation, of each variable are in Table II.

TABLE II: DESCRIPTIVE STATISTICS OF RESEARCH VARIABLE DATA

Group	n	Mean±SD
A_1B_1	11	80.85±4.51
A_2B_1	11	75.33±4.51
A_1B_2	11	84.39±2.80
A_2B_2	11	77.52±5.90

A descriptive analysis of research data on the physical condition of Skadik 404 Military Police Corps Lanud Adi Soemarmo participants revealed statistically significant differences in the mean value and standard deviation of the research variables. The military fitness group of Military Police Corps members trained five times per week using the basic military training method (A_1B_1) showed an average pretest and post-test with (r=84.39 2.80), it can be concluded that. On the military physical fitness variable, members of the Military Police Corps who trained five times per week using the basic military training method (A_2B_1) displayed an average value of (r=75.33 4.51), while members of the training group who trained three times per week using the Tabata training method (A_2B_2) displayed an average value of (r=77.52 5.90). This

suggests that, as indicated by the various numbers, there are striking discrepancies between the mean values for the two groups. To ascertain whether the data were regularly distributed, preliminary calculations were also performed in this investigation. Table III below shows the outcomes of normality calculations for the Kolmogorov-Smirnov Z (KS–Z) test with a significance level of=0.05.

TABLE III: NORMALITY TEST ANALYSIS DATA

Group data	N	L_{count}	L_{table}	Description
A_1B_1	11	0.005	0,258	Normal
A_1B_2	11	0.002	0,258	Normal
A_2B_1	11	0.025	0,258	Normal
A_2B_2	11	0.149	0,258	Normal

The physical condition of Skadik 404 Military Police Corps Lanud Adi Soemarmo members as a whole is normally distributed according to the Hasil normality test in Table III because Lcount>α=0.05. The Barlett test was then used to continue testing for homogeneity at the level of α=0.05. The calculations of homogeneity of variance in four groups of cells created by the experiment using the Barlett test at the level of α=0.05 are shown in the table below. In Table IV, the findings of the homogeneity analysis with the Barlett test utilizing the homogeneity of variances analysis are recapitulated Table IV.

TABLE IV: HOMOGENEITY TEST ANALYSIS DISCUSSION

Group	χ^2	χ^2 tabel α = 0,05	Sig. (p)	Description
A_1B_1, A_2B_1, A_1B_2, dan A_2B_2	0,623	33,924	0,603	Homogenous

It can be concluded that the six groups of data tested came from populations with homogeneous variances based on the test results, which show that the Levene test yielded a value of 0.623 and p=0.623>0.05. Alternatively, the test shows that the value of χ^2_{counts}=0.623 is smaller than the value of χ^2_{tables}=33.924. Based on the two tests that were performed to determine whether the analysis requirements were met, it can be concluded that they were. This makes it possible to conduct additional analysis to compare the effects of different exercise methods, such as Tabata and basic military exercises, and different exercise frequencies, such as five times per week and three times per week, on military physical fitness. This study compared the basic military training and Tabata on military physical fitness of the Skadik 404 Military Police Corps Lanud Adi Soemarmo members who trained five times per week and those who trained three times per week. Additionally, two-way variance analysis was used to test the main effect (main effect) and interaction (interaction effect) of free variables related to variations in training methods (basic military training and Tabata), frequency of exercise (frequency of exercise five times per week and frequency of exercise three times per week), and bound variables, specifically military physical fitness. The acquired computation results are then summarized in Table V.

TABLE V: RECAPITULATION OF ANAVA RESULTS FOR MILITARY PHYSICAL FITNESS

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	403.910[a]	3	134.637	4.526	0.008
Intercept	262175.677	1	262175.677	8814.016	0.000
Method	137.731	1	137.731	4.630	0.038
Frequency	133.893	1	133.893	4.501	0.040
Method * Frequency	171.169	1	171.169	5.754	0.021
Error	1189.813	40	29.745		
Total	276545.432	44			
Corrected Total	1593.722	43			

a. R Squared=0.253 (Adjusted R Squared=0.197).

Table V's findings from the analysis of the variance of the two paths can be summarized as follows: (1) Basic military training methods and Tabata have different effects on the development of military physical fitness (F-c_{ount}=4.630>F-$_{table}$ for degrees of freedom 1 and 40 and values of 4.08) or F-$_{count}$>F-$_{table}$; (2) The effects of exercising five times per week and three times per week have different effects on the development of military physical fitness. Since it is clear from the preceding explanation that each treatment element and its interaction have a significant impact, additional statistical calculations are made using SPSS 25 analysts to test the study hypothesis (advanced test) using the Tukey test in Table VI.

The three hypotheses that have been put out as a whole can be accepted based on Table VI above since the significance difference (p) is less than α=0.05 or the likelihood is significantly below 0.05. Therefore, it may be inferred that there are several approaches and frequency levels for enhancing military physical fitness.

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TABLE VI: RECAPITULATION OF ADVANCED ANAVA RESULTS USING THE TUKEY TEST

There were no comparison hypothesis groups	$Q_{\_count}$	$Q_{\_table}$	Sig.	Description
A_1 and A_2	5,381	1,171	0.002	There are differences
B_1 and B_2	5,381	1,171	0.019	There are differences
Int. AxB	5,754	1,171	0.021	Interactions Occur

Therefore, it can be stated that there are variations between the frequency groups of five and three times per week in the improvement of military physical fitness in members of the Skadik 404 Lanud Adi Soemarmo Military Police Corps. The hypothesis test's findings thus indicated that the interaction between the type of exercise and the frequency of exercise had an impact on the development of military physical fitness. We can conclude that the frequency of exercise and the training method interact. The way that the different characteristics of the Skadik 404 Lanud Adi Soemarmo Military Police Corps members interact in this calculation makes it clear why these characteristics affect different training methods as well as how they interact with one another and positively impact training, especially when it comes to enhancing the military's level of physical fitness.

IV. DISCUSSION

The variance analysis's findings demonstrated how the combination of training techniques and activity frequency each week affected the development of military physical fitness. This indicates that the frequency of exercise has a direct impact on how accurately the exercise approach is used. The frequency of workouts must be taken into account while choosing the trainer's training strategy. These findings demonstrate how treatment of exercise methods, whether fundamental training techniques or Tabata, depends on the frequency of exercises. The findings of this study demonstrate that employing Tabata and standard military training techniques, exercise frequency has an impact on physical fitness. To provide the right exercises and obtain the best results, the trainer should take into account both high and low frequencies of exercise.

Exercises conducted by members of the Skadik 404 Military Police Corps Lanud Adi Soemarmo, who participate in them three times a week, will be carried out with strong morale. The Skadik 404 Military Police Corps Lanud Adi Soemarmo, on the other hand, trains five times a week, necessitating greater care on the part of the trainer. To help the Skadik 404 Military Police Corps Lanud Adi Soemarmo troops become more physically fit, trainers must train as hard as they can. Because of this, trainers occasionally have to decide on the types and quantity of workouts to perform to increase physical fitness. As a result, when compared to employing standard military training techniques, members of the Skadik 404 Lanud Adi Soemarmo Military Police Corps were given the Tabata exercise.

The findings of Pihlainen's study demonstrate that military training requires a broader variety of training stimuli to induce more effective training adaptations when it comes to the development of maximal or explosive strength and maximum aerobic capacity. Training schedules should be meticulously planned so that the total amount of training load grows gradually and allows for enough recuperation time. Additionally, some exercise programs were tailored to military characteristics to prevent injuries and overloads due to the large variations in the starting physical fitness of soldiers (Pihlainen *et al*., 2017).

The findings of Santila's study support this, showing that periodization and individualization of exercise regimens for military training should also take into account upcoming military tasks (tailored physical training), prior physical activity, physical fitness, and body mass index. It should be noted, nonetheless, that the training principles for conscripts and professional troop recruits can slightly vary due to the stark contrasts in their backgrounds in military physical training. The greatest training regimens are gradual and progressive because they can maximize the benefits of training while lowering the likelihood of overtraining and injury (Santtila *et al*., 2017).

While the Tabata training method is an exercise that is performed as part of high-intensity interval training (HIIT) or high-intensity interval training, the basic military training method is an exercise method that has been used for generations. Here, every technical movement is taught through the training implementation guidelines authorized by the Air Force Headquarters. Numerous studies have demonstrated that Tabata is still a very efficient method of reducing body fat and calorie intake. Arisman's analysis Strength and resistance training are frequently combined in Tabata training. This workout utilizes a straightforward system and is based on the time interval method. To do the workout in 4 minutes, for instance, one could exercise for 20 seconds at their utmost capacity, followed by a 10-second break. The body must remain active throughout the brief rest interval to recover from the previous set. Exercises like Tabata can burn a lot of calories because each movement engages a different body system, such as the heart, lungs, and muscles (Arisman, 2021). Different effects on the physical fitness of the soldiers were seen as a result of the differences in these two training regimes' characteristics.

The results of this study reveal that training frequency has an impact on the effectiveness of both Tabata training and conventional military training techniques. To get the best results, the trainer must consider both high and low exercise frequency when offering instruction to acquire appropriate military physical fitness. The findings of Campos' study, which found that changes in physical fitness are brought on by physical activity after an exercise program, support the findings of this study. These results support the hypothesis that a 12-week military physical training regimen contributes to long-term gains in physical fitness and body composition. Additionally, it backs up the notion that thorough monitoring of military physical fitness might be accomplished through testing with clear standards. Therefore, it can be said that the practical application of this knowledge is necessary for the efficient management of physical training programs, which will help to improve the physical fitness and quality of life of military personnel (Campos *et al*., 2017).

Then, according to Prontenko's research, weight training had the greatest favourable impact on endurance, flexibility, and static muscle endurance. Furthermore, compared to exercises that adhere to the physical training system, weightlifting training has a greater impact on the level of physical fitness of cadets (Prontenko *et al*., 2017). The findings of this study support Dawes' findings, according to which this was the sole investigation into how regimented training regimens and semester breaks affected the physical capabilities of police trainees. Since semester breaks without a planned and supervised exercise program might lead to increased weight, the results of this study imply that planned and supervised prolonged exercise, carried out through physical education classes, can enhance anthropometric and fitness characteristics in police trainees (Dawes & Orr, 2019)

There is no denying the impact of settings, systems, and policies on physical activity to increase physical fitness (Jariono & Subekti, 2020; Wulandari *et al*., 2022). Efforts to increase the quality of an active life through health-improving exercises (Jariono *et al*., 2020; Nugroho *et al*., 2021). According to the report, several nations that were formerly infamous for their exorbitant public health costs now represent disproportionate threats to military readiness and national security (Bornstein *et al*., 2018). Through analysis of the level of general physical abilities and military motor skills in the structure of contemporary needs for various types of combat operations and missions, such as increased stamina and strength, overcoming obstacles using complex coordinated movements in a short amount of time, conducting remote activities with full equipment, it is possible to unite the directions of the main principles of practical training for all categories of military personnel (Klymovych *et al*., 2020).

According to Burley's research, there is a good likelihood that soldiers can become physically stronger during the military training phase to be better prepared for operational deployment. Performance in military work can be significantly improved by concentrating on increased load, functional strength, and local muscular endurance in particular (S. D. Burley *et al*., 2018). The findings of this investigation supported Aumgartner's assertion that the primary focus is on preparing soldiers physically. Preparation for both the performance of safe general duties that service members may have to conduct as well as for more advanced training in a specific specialization is crucial. Exercises that require physical fitness for the military include aerobic and strength training. Increased aerobic activity can counteract the advantages of weight training and lower injury rates(Aumgartner *et al.*, 2015).

The significance of physical fitness for performing military tasks examined by exercise interventions is emphasized by Vaara's research. A mix of strength, aerobic exercise, and specialty weight training can greatly increase physical fitness, according to studies on training interventions. A person's maximal capacity can be raised through strength training or a combination of strength and aerobic training. Exercises including repetitive weightlifting that are more practical and effective for enhancing troops' performance while on duty can also benefit from the strength and aerobic training (Vaara *et al*., 2022). Enhancing troops' physical fitness results through basic military training must go hand in the side with good and meaningful physical exercise (Bornstein *et al*., 2018). A basis is required that can accommodate the implementation of physical training, in this case, a law that is the guideline and adjusted to the theoretical basis so that the optimization of physical development can be achieved, and it is necessary to evaluate it through research so that the results of physical fitness can be achieved following the requirements.

This idea states that to encourage the proper physiological adaptations that support an improvement in the level of physical performance, TNI members must continually perform at close to their maximum capacity (Issurin, 2010; Laursen & Buchheit, 2019). The development of physical freshness gradually, stratified and continually is one of the people strength coaching functions that are implemented for physical freshness coaching to perform as effectively as possible (Campos *et al*., 2017). Following the directives of the 1945 Constitution and The Law of the Republic of Indonesia Number 34 of 2004 regarding the Military, (TNI, 2004), the main component of the force to maintain the unitary state of the Republic of Indonesia, must be able to empower and utilize existing resources to be ready for mobilization as specified in the applicable legislation (Fanchini *et al*., 2019; Franchini, 2020). . If Tabata exercises are delivered following needs and at the same time as supplemental training, they can be deemed appropriate (Domaradzki *et al*., 2020; Ekström *et al*., 2019; Tabata, 2019). Tabata training is a high-intensity, brief-duration activity in

which efforts approach maximum, maximum, or supramaximal, continued in a short interval of passive or active recovery. This technique has been shown to raise blood pH tolerance, the size of the mitochondrial muscles, and anaerobic capacity, among other aerobic and anaerobic adaptations (Gillen & Gibala, 2014; MacInnis & Gibala, 2017). Three forms of HIIT are being used in research and training literature: standard HIIT, interval sprint training (SIT), and repeating sprint training (RST) *(S. Burley, 2015; S. D. Burley et al*., 2018; Pihlainen *et al*., 2017; Vaara *et al*., 2022).

V. Conclusion

Physical fitness measurements of the type and frequency of exercise revealed an average difference in reaction in trained soldiers. The difference between training five and three times per week appears to depend on the level of physical workload on the Tabata exercise method and the fundamental military exercises, at least within the range of exercises studied. Insignificant effects of interaction between methods and frequency of stage exercises were observed. However, compared to standard military exercises, measuring the military's physical fitness using Tabata activities during testing can produce more conclusive results. However, more study is required to improve military physical fitness, particularly in the areas of psychological moods, psychosocial issues, social environments, and physical circumstances.

Appendix

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Conflict of Interest

There are no financial or other conflicts of interest, according to the authors.

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