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The Correlation of Training Frequency on Generalized Hypermobility Joint in Ballerina at Namarina Dance Academy, Jakarta

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ABSTRACT

The Dutch East Indies became the initial place for the development of ballet in the Indies. The arrival of a Russian ballerina named Anna Pavlova in 1929 succeeded in popularizing ballet among the people of the Indies. This group of ballet dancers toured major cities in the Indies to provide relaxing entertainment. Batavia (becoming Jakarta) then became a city that was crazy about ballet dance, spreading to other big cities in Indonesia. However, due to a lack of education and information, many ballet dancers do not realize that they are experiencing GJH.

This research aims to determine the relationship between training frequency and GJH in the ballet dancer population in Jakarta, especially at the Namarina Dance Academy and to provide information regarding the relationship between training frequency and GJH experienced by ballet dancers so that dancers can be more careful when carrying out their profession.

This research uses a cross-sectional design with samples taken using purposive sampling. The total sample was obtained using the Slovin formula and 83 samples were obtained. Data was collected by measuring the frequency of dancers' practice using the IPAQ-short questionnaire and GJH using the Beighton score. The results of this study showed that 4 people (4.8%) were affected by mild hypermobility, 31 people (37.3%) were affected by moderate hypermobility, and 48 people (57.8%) were affected by severe hypermobility, in other words, they were in the Generalized Joint Hypermobility (GJH) category.

The conclusion from this research is, that this research produced a significance value of 0.000 ($p<0.5$) and a positive correlation value of 0.439, which means there is a significant relationship between practice frequency and GJH in ballet dancers at the Namarina Dance Academy Jakarta.

Keywords: Exercise Frequency, Joint Hypermobility, Ballet Dancer

INTRODUCTION

Ballet is a dance art with special techniques that are displayed on the stage. It originated in Italy and developed rapidly in France. Ballet has steps, movements, music, clothing or costumes, make-up, and stage decorations specific according to the story you want to show. Ballet dance has three dance combinations, such as solo, *pas de deux*, and *corps de ballet*. As the name suggests, solo dance is danced by a professional ballerina with technique, expressive face, and perfect body language

so that it can support the story. conveyed through movement. *Pas de deux* is another word for duet, which means A pair of ballet dancers dance this dance. This type of dance is performed by ballerinas (female ballet dancers) and danseur (male ballet dancers). The *corps de ballet* is a dance that is performed in groups or a group dance (Academy Dancing of Ballet in Yogyakarta, 2009).

Ballet in Indonesia was first introduced in 1982 by three Dutch ballet teachers named Puck Meyer, Lastdrager, and Ludwig Warner so that after that Indonesian ballet dancers appeared who influenced the development of ballet schools in Indonesia such as Farida Oetoyo (Source) Cipta), Nanny Lubis (Namarina), Marlupi Sinjangga (Marlupi), and 2 James Danandjaja. There are already hundreds of ballet schools in Indonesia with a number of students most are in Jakarta and Surabaya (Mulyadi, 2007).

The art of dance itself requires complex movements that force dancers to move more widely to extend the range or scope of movement to normal joints (Jannekeet al., 2022). Expansion of the range of motion of the joints from the limits should be called hypermobility joint or joint hypermobility.

This joint hypermobility can occur due to connective tissue abnormalities. (Timmons, 2021), family or genetic inheritance, and can also be acquired due to years of practice (Tinkleet al., 2017). If a person has more than one hypermobility joint, then that person can fall into the category of Generalized Hypermobility Joint (GJH) (Katie Phanet al., 2019). Several previous journals stated that the incidence of GJH in ballet dancers is higher than in the general population. This comparison can be seen from several factors such as age, gender, and work experience of dancers do their profession (Bulbena)et al., 2017). Based on the research report conducted in Switzerland in 2022, as many as 57% of GJH cases occurred in dancers young with high performance. Although GJH can cause risks to health and or injury, in the GJH dance community is often seen as one of the factors that is useful in terms of aesthetics and becomes a marker if The dancer has talent. The dance has complex movements that slowly expand the reach of the joints. Then based on the results of the review done in the United Kingdom, said that a person's profession as a dancer often shows and promotes joint hypermobility for aesthetic reasons and are convinced that the potential for GJH in dancers has been ignored. This report states that the incidence of GJH in dancers can increase to 44%, especially for dancers who are still students (Day et al., 2011). Report results made in Edinburgh, Scotland, said that GJH has properties that complex. This research report states that GJH is very common in young ballet dancers. However, as the dancer's career progresses, the GJH experienced by the dancers has no relation to the injury which is likely to be a feature protector of the dance practice that is being done. It is said that the dancers who experience joint hypermobility have a good indication for him because have a larger physical capacity. This report also provides evidence that there will be changes in body awareness, including increased relationships between body and mind, and increased anxiety (Timmons, 2021).

Most dancers experience joint hypermobility. In addition to the time period dancers do their profession, several factors such as age, gender, and race are also factors influencing the occurrence of GJH (Kang et al., 2020). Female dancers are more affected by GJH than male dancers.

To determine whether a person has joint hypermobility or not, measuring joint hypermobility can be done using several rating scales. The scales commonly used are the Beighton score, Judge & Graham Questionnaire, and Sasche's Scale (Skwiotet al., 2019). 4 Beighton score itself is an assessment using scores to measure flexibility and how much joint hypermobility a person experiences. Beighton score contains the five highest scoring questions overall assessment is 9

(nine). The higher the number generated on measurement, the higher the value shows how high the flexibility and Joint hypermobility. Interpretation of Beighton score consists of values with a score of 0-4 called mild or normal hypermobility, a value of 5-6 is hypermobility moderate, and a score of 7-9 is severe hypermobility or can be called Generalized Hypermobility Joints(I Putu and Suartika, 2018). Hakim & Grahame questionnaire also becomes one of the measuring tools to identify hypermobility joints. This questionnaire contains five sections covering aspects of family history. events and symptoms currently experienced. Interpretation of the Hakim & Grahame questionnaire is a minimum of two positive values are considered as an indicator of hypermobility joint (Schlager, 2020). Sasche's scale consists of 13 tests with three levels or degrees of evaluation, level A means that joint mobility is in the hypomobile to normal, and level B means that joint mobility is within the normal to high range. hypermobile, and level C means marked joint mobility. Sasche's interpretation This scale is at least there are 7 positive values from 13 tests to state that someone is affected by hypermobility joint.

This research was conducted with the title The Relationship Between Exercise Frequency and Generalized Hypermobility Jointson the DancerBalletin NamarinaDance Academy Jakarta because it is important to know whether there is a relationship or correlation between frequency and Generalized Hypermobility Joints (GJH) dancer ballet measuring tools and knowing until now is still very 5 There are few journals or literature that examine this incident in ballet dancers in Indonesia. By knowing the relationship between exercise frequency andGeneralized Hypermobility Jointon ballet dancers in NamarinaDance AcademyJakarta, It is hoped that the research results can provide a better understanding regarding hypermobility or flexibility of the dancer's body as an advantage which supports the dancer's ability to carry out his profession as a dancer.

LITERATURE REVIEW

Exercise Frequency

Definition of Exercise

Exercise is one of the important elements to achieve performance. Training must be done continuously with weights, duration, and intensity that increase and is measured to improve quality and physical abilities according to goals and needs. Exercise is an activity that is systematically designed to increase potential and performance.

Definition of Exercise Frequency

The frequency of training is the number of days of training in one period. week. The recommended exercise frequency to achieve progress and development is 4 times a week which is included in the characteristics of intensive training (Prayuda, 2016). The frequency of training is something that needs to be considered. The frequency of the exercise performed does not necessarily provide maximum results, either in the long term or short term. However, the length of the training will provide a habit in movements that have not been mastered before. This is It is important to note that someone can master the technique and get it. good physical condition (Setiawan, 2021).

Exercise Frequency Measuring Tool

Exercise frequency is one of the points that is measured for determine how often or how much a person does physical activity in units of time. Physical activity itself can be measured by using a questionnaire. One of the questionnaires that can be used is Physical Activity Questionnaire (PAQ). This PAQ is used to measure dimensions of physical activity including types of physical activity, frequency, duration, and intensity of activities performed. Frequency data exercises were collected using the short version of the PAQ typeInternational Physical Activity Questionnaire (IPAQ) or IPAQ-short. IPAQ-short assess the time

spent on physical activity during the last seven days (Suryabrata, 2019).

Generalized Hypermobility Joints

Definition Generalized Hypermobility Joints

Hypermobility or hypermobility is the ability to move joints outside the range of motion considered normal. General hypermobility joint (GJH) can occur in one or more joints (Phan K., et al., 2019). General joint hypermobilityis a genetic disorder that occurs in connective tissue that is characterized by loose joints and hypermobility. The reported prevalence of GJH in ballet dancers is much higher. high when compared to the general population. This comparison is seen from various factors such as gender, age, and the dancer's experience in carrying out his profession as a dancer (Bulbenaet al., 2017).

Epidemiology

Joint hypermobility describes the ability of a joint to moving beyond the normal limits of the range of motion (ROM). In particular, The main anatomical and physiological contributors to joint mobility are articular surface health, bone morphology, muscle tone, and integrity soft tissue bones that surround joints, including ligaments and tendons. Gender, age, and ethnicity are contributing influences. each component to Range of Motion (ROM) in individuals certain with a mixture of congenital or developmental and acquired or degenerative. Factors that affect ROM that can modified to include nutritional status, body weight or body composition, physical activity, training, previous trauma or injury, and surgery (Morlino et al., 2023)

In general, joint hypermobility can occur in the population. common and often the nature of joint hypermobility is benign without there is a significant relationship related to health. Observations made by Morilo and Castori show that Joint hypermobility is more evident in women (57%) than in men. with men (35%), and also in children and adolescents. Hypermobility joints are more common in Inuit, African, and Asian people. compared to Europeans. (Morlinoet al., 2023)

Physiology and Pathology Generalized Hypermobility Joints

People with joint hypermobility often experience pain that caused by the joint structure becoming loose. Problems physical problems that can occur are poor balance, chronic pain, and other health problems. This can be seen from the flexibility of the joints which is very extreme. Hypermobility of the joints experienced by a person can occur due to several things such as genetic, physical, and environmental factors psychological. There will be a known possibility of hypermobility of the joints due to genetic inheritance but the specific gene has not been identified, then bad body position can increase the risk of Injuries and weak muscles can cause instability in the joints and pain. People who experience joint hypermobility are likely to have a fear of pain which causes lack of activity so that it can worsen existing problems (Carroll, 2023).

Hypermobility in the joints can be caused by weakness ligaments or joint deformities that can be caused by congenital disorders. People who experience joint hypermobility disorders really need help to improve muscle strength, balance, and joint stability. Some things that can be done are physical exercises that have targets to strengthen muscles, improve balance, and reduce muscle tension. There are also other non-medical treatments such as dry needling which is useful for relieving muscle tension and occupational therapy which is useful for reducing tension in the joints (Hakim, 2024).

Measuring Instruments Generalized Hypermobility Joints

Beighton score is a score used to measure joint flexibility and hypermobility and contains five components of questions with a maximum score of nine points. The higher the score Beightonthen it becomes more

flexible someone's joints are. Interpretation Beighton score is a score of 0-4 is mild or normal hypermobility, a score of 5-6 is moderate hypermobility and a score of 7-9 is severe also called generalized hypermobile joints (I Putu and Suartika, 2018). Based on the table Brighton score a person is said to have joint hypermobility if the specific joint measured exceeds the normal joint range. Each positive hypermobility joint is given a score of 1 point on both the right and left sides (Folci and Capsoni, 2016).

Specific joint laxity	YES	NO
1. Passive apposition of thumb to forearm	☐ Left ☐ Right	☐
2. Passive hyperextension of V-MCP > 90°	☐ Left ☐ Right	☐
3. Active hyperextension of elbow >10°	☐ Left ☐ Right	☐
4. Active hyperextension of knee >10°	☐ Left ☐ Right	☐
5. Ability to flex spine placing palms to floor without bending knees	☐	☐

*Each "YES" is 1 point. A score ≥ 4 out 9 is generally considered an indication of JH. (MCP: metacarpophalangeal).

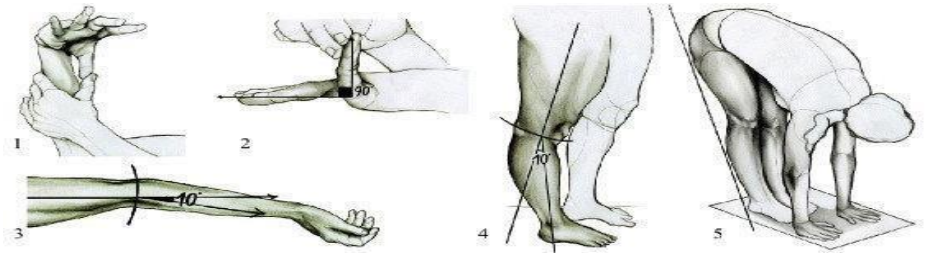

Figure 1. Table of Beighton score (Source: Folci and Capsoni, 2016)

Generalized Hypermobility Joint in Ballet Dancers

As a dancer, there will likely be several joints experience movement that exceeds the normal range of motion. HG is a description of a condition where the joints are able to move beyond the expected range. HG in dancers is a common thing that occurs to maintain joint flexibility and flexibility. Joint hypermobility in ballet dancers can occur for various reasons and in most cases never causes any health problems. Joint hypermobility that occurs in ballet dancers depends on various factors such as training factors, bone shape before the dancer was injured, and muscle strength. This is also influenced by other factors such as genetics, collagen strength, gender, and age. Many studies have shown that the frequency of HG is more common in dancers. Increased joint hypermobility that occurs in dancers can be beneficial for improving aesthetics. Still, several studies suggest that dancers with HG should maintain their health such as by identifying unstable joints. This can be done by doing physical therapy and complementary activity programs (Bluestein, nd) such as pilates which provide exercises that emphasize the development of joint and muscle endurance and strength and help reduce additional movement around the joints and reduce the potential for injury that may be experienced by dancers (Bluestein, nd).

Ballet Dancer

Definition of Ballet Dancer

The definition of a ballet dancer commonly called a ballerina according to the Cambridge Academy Content Dictionary a woman or women who do ballet dancing professionally. While for male ballet dancers or male dancers, can be called danseur or principal dancers if the dancer has a high position in the company dance. It takes about 8 to 10 years to become a dancer. professional ballet. Ballet students begin their training at the age of seven. year with one to two ballet classes each week. As age increases, the classes that the dancer will attend will increase—more and more. There will be ten to fifteen engineering classes attended by ballet students,

including pointe (women only), modern, jazz, pair, and others.

A ballet dancer's career has a similar period to that of an athlete. other professionals, depending on each dancer's body and injuries. experienced. When the dancer retires from the stage, the dancer can continue their 8 professions in the field of master or ballet master, choreographer, teacher, and even choose a different career.

Physiology of Dance

The physiological response to dancing depends on the intensity, duration, and frequency of exercise. During exercise, the need for oxygen and substrate in skeletal muscle will increase. As well as disposal of metabolites and carbon dioxide. The presence of chemical stimuli, mechanical, and thermal also affect metabolic changes, cardiovascular, and ventilators to meet the increasing need This. A good dancer must have good coordination, highly developed kinesthetic awareness, and control balance in movement. Endurance is very important for continue show dance Which prolonge for develop an awareness of space, sense of rhythm, and appreciation to music. In theater dance, dancers must have the ability to project movement clearly and have expressiveness quality so that it can be understood by the audience (Firdaus, et al., 2019, Sabaanth, et al., 2014).

Dance Biomechanics

Biomechanics is a scientific discipline that studies the principles human movement mechanics that provide information about function muscles and their characteristics. Biomechanics can improve the ability dancers to detect the root cause of errors that occur during perform certain movements and avoid movements that have potential for injury. Information about muscle function can helps specialists detect overtraining or fatigue which has a negative impact on the performance and well-being of dancers (Kuotedakis, 2008).

Basic Ballet Dance Movement

Based on *Pittsburgh Ballet Theatre*, there are five *basic positions* in the lower extremities are named in order from number one to five. Each of these positions uses rotational movements of the lower extremities by 90 degrees from the hip joint. The movements are:

1. *First position*: Heels together, toes pointing outwards.
2. *Second position*: position of both legs stretched and opened as wide as possible hips, toes pointing outward.
3. *Third position*: both feet pointing outward, one foot placed in front of the other foot with the heel of the front foot touching the the other foot.
4. *Fourth position*: the position of the feet in the fourth position is the same as the position three, but the front legs are spread out so as to create a distance between the front legs and the back legs.
5. *Fifth position*: the position of the feet is the same as *third position* and *fourth position*, bring your feet together so that the heels of your front feet touch hind toes.

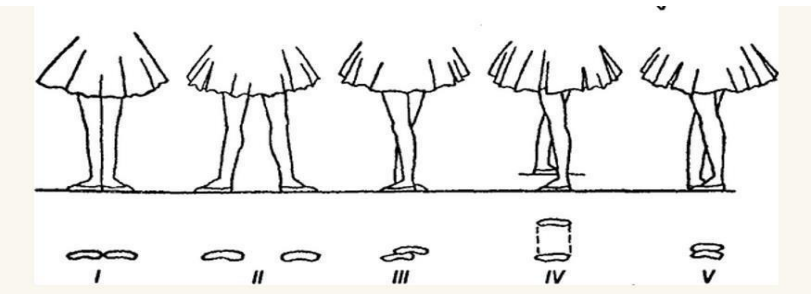

Figure 2. Foot Positions in Ballet
(Source: Vaganova, 1969)

Taken from the same article, there are five basic positions on upper extremities are named in numerical order from one to five plus one starting position. The movement
is :

1. *Bras Bass*: Starting position movement where the arms form an oval shape just in front of the thighs, below each shoulder. This position ensures that the shoulders remain open and relax. Hands do not touch the feet and are positioned slightly forward, elbows pointing to the side.
2. *First Position*: This position maintains the oval shape of the position. Bras Bas with sleeves raised to waist or navel level. In this position, the dancer must be able to keep the distance between both hands. Position palms facing the dancer, and elbows facing the side.
3. *Second Position* or or *The second*: Hand position stretched out to the side but slightly in front of the body. The arms are not stretched horizontally to the side, but there is a slight downward slope from the shoulder.
4. *Third Position*: In this position, one hand is placed in the position first position and the other hand in second position.
5. *Fourth Position*: One arm is positioned in the first position.
6. *Fifth Position*: The arm shape is the same as the position *Bras Bass* And hands raised above the head but slightly forward, opposite with hairline.

Young dancers will begin to practice this position with a more relaxed hand position forward. As they begin to gain more power and control over movement and maintaining their posture, these positions will move further backwards. Higher level dancers will use the Fifth Their position is above the head to do the spin and Grand Allegro movements or a movement that refers to a large and wide jump.

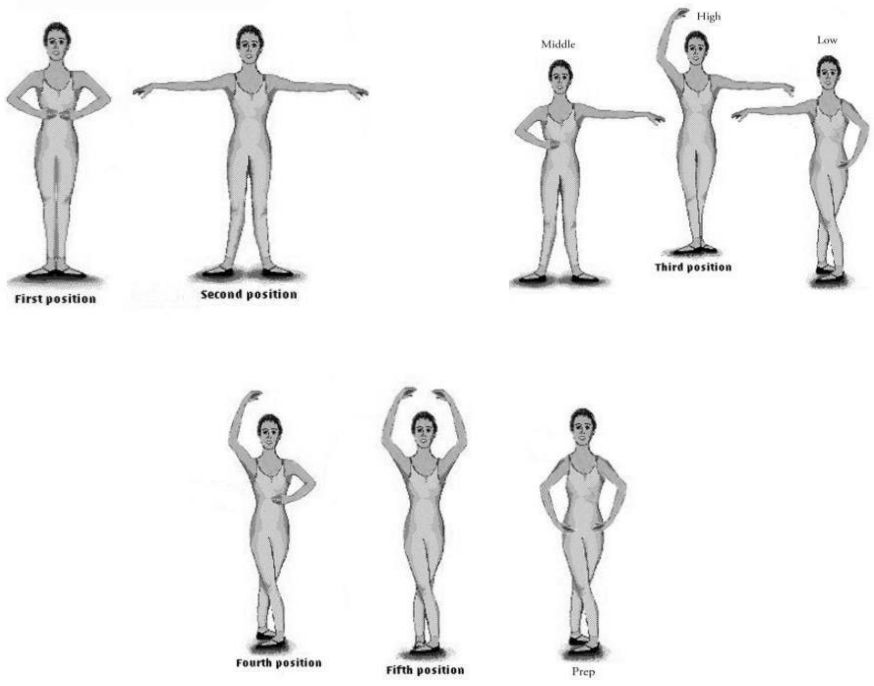

Figure 3. Hand Positions In Ballet
(Source: Ayazoğlu, S., *et al.*, 2021)

According to an article by Foundations Dance Collective, some steps in ballet are called "*movements in dance*". Beginner ballet dancers learn ten basic movements.

These movements are:

1. *Plie*(plee-ay) the most basic movement which is the movement of bending the knees. This most basic movement helps warm the body (*warm up*), increase flexibility, build leg strength, prepare back for more complex movements.
2. *Relevé* (ruh-leh-vay), is a jijit or to rise movement that can done with one foot or two feet simultaneously. In the movement Here, the entire body weight rests on the soles of the feet.
3. *Tendu*(than-dew) or*to stretch*, stretching, is an extension feet along the floor. Extension is done without bending the legs, heels up, and toes*pointe*. When the dancer returns to the first*position*, movement Performed with toes and heels down.
4. *Dégagé* (dey-ga-zhay) or to disengage, like tendu,*degenerate*involving extension that builds tension between the feet and the floor. Pointed toes and lifted off the floor. The dégagé movement is challenging. dancers to control their muscles and movements while maintaining proper movement alignment.
5. *Round the Jambe a Terre, on the ground around the leg on the ground*, this movement focuses on the circular motion of the working leg or*working leg*.*Working leg must* know the position of the tendu devant (front), *second time* (side), and derriére (back). During this movement, the hips should remain still and the dancer must be able to pull the working leg away from the supporting leg to provide enough space for the working leg to move. Movement *round the hill on the ground*train dancers to improve flexibility hips and teaches dancers to maintain balance and control while moving.
6. *Développé*, or *develop*, a movement that displays high leg extension dancer. The dancer will bring *working leg* through the *passé* then move out.
7. Arabesque is a movement that involves balance on one side foot (*Supporting leg*) while stretching out the other leg (*working leg*) appropriate behind the body (*derriere*). The upper body remains in an upright position and high leg position trained over the years.
8. *Grand Battle*is a movement with a big beat, in other words,*grand battle*is a movement of lifting the leg to a point the highest powerful. This movement suppresses strength and dancer flexibility.
9. *Chassé*or*to chase*, is a stepping or walking movement where one leg chases the other leg which will create a gliding motion smooth. This movement teaches the dancer to shift weight their bodies smoothly on the floor.
10. *Jeto*r*to throw*, is a jumping movement where the dancer jumps on one foot and land on one foot. Jeté can be done with or without foreleg development, resulting in movement graceful and dynamic air. These basic positions will be performed by dancers throughout their careers, with the demands of aesthetics, ballerinas will perform movements with greater strength and form of movement. This is what causing ballerinas to experience GJH as their dance experience progresses they.

Factors of Occurrence Generalized Hypermobility Joints on Ballet Dancer

Dance is associated with a series of explosive movements and requires balance, athletic, and artistic abilities. With the presence of These three things create a movement that shows complexity and intense. To achieve complex and intense movements, movements These movements require physical attributes including strength, speed,

power, agility, cardiovascular endurance, flexibility, coordination, and balance (Simon*et al*., 2014). Dancers are required to perform movements that exceed the

normal anatomical range so that they can increases the risk of injury (Armstrong, 2020).

As time goes by, the duration and frequency of exercise done repeatedly over a long period of time will slowly cause joint movement to exceed its normal scope and increase flexibility in certain muscles. A person with symptoms of HGH usually have poor fitness or stamina, loss of proprioceptive acuity such as loss of balance, and increased levels of depression and anxiety (Mark C,*et al*., 2012). Conditions *generalized joint hypermobility*is one of the factors that benefits dancers by increasing mobility of the joints, including small joints and large joints in the body. This condition also benefits ballet dancers in enhancing the aesthetics of their dancing. Several factors that cause a dancer to experience this condition *generalized joint hypermobility*are age, gender, and race. (Kang *et al*., 2020).

MATERIALS & METHODS

Research Design

The research method used is the approach methodcross sectional, where researchers will conduct observations on ballet dancers what is done is there are different classes or levels and methods of taking the sample used is the methodpurposive sampling. This method used to determine samples with criteria that match author's inclusion and exclusion criteria.

Place and time of research

This research was conducted at Namarina Dance Academy Jakarta, June 2024

Population and sample

Research Population

a. Target Population

The target population in this study was ballet dancers.

b. Reachable Population

The accessible population in this study were ballet dancers in Namarina Dance Academy Jakarta

Research Sample

The sample of this research is the dancers in NamarinaDance Academy Jakarta and meets the following inclusion and exclusion criteria.

1. Inclusion Criteria:

a. Female ballet dancer in NamarinaDance Academy
b. Be at a level or degreeGrade5 toVocational Grade Intermediate Foundation – Advance Awarded
c. Have been dancing for 6 years or more
d. Beighton's score is more than or equal to 4
e. Fill informed consent form

2. Exclusion Criteria:

a. The dancer has experienced and or has a history of injury and orfracture more than 1 (one) year Example: dislocation hip, femur fracture.

Sample Size

The sample size was calculated using the cross sectional formula according to Slovin, 1960, as follows:

$$n = \frac{N}{1 + Ne^2}$$

Information:
n = sample size
N = population size
e = margin of error of 5% or 0.5

Results:
n = 88/1+(88x0.52)
n = 88/1+(88x0.0025)
n = 88/1+0.22
n ≈ 72.13 rounded to 73

To overcome sample drop out (not participating in research and/or not following research procedures properly), the sample number will be increased by 10% of the initial number so that the following results are obtained:
n = 73 + (10% x 73)
n = 73 + 7.3
n = 80.3 rounded to 81

Variables

Independent Variables

The independent variable in this study is the frequency of ballet dancer practice.

Dependent Variables

The dependent variable in this study is Generalized Hypermobility Joints.

Control Variables

The control variable in this study is the type of exercise.

Operational Definition of Variables

Exercise Frequency

Exercise frequency is the repetition of exercises performed by dancers within a week. Data collection related to training frequency done by filling out the form.

Generalized Hypermobility Joints

Joint hypermobility condition measured using the Beighton Score, on a scale of 0 to 9. The dancer will be declared to have generalized hypermobility joint if the score obtained is more than 4.

Research Instruments

Research instruments are tools used in research during research is ongoing. The instruments used in this study is :

a. Form informed consent for willing sample agreement follow the research
b. Respondent identity form
c. Beighton score to measure hypermobility joint
d. Goniometer as a measuring tool hypermobility joint
e. IPAQ-short as a measuring tool for exercise frequency
f. Books and stationery for recording data
g. Laptop for data processing
h. Camera to document research

Research Procedures

1. The researcher will create a research team consisting of 5 people and divide them intojob descriptionon each member of the research team. One person will explain research procedures and improveinformed consent, one person will do anamnesis, then others will do measurements with the IPAQ formula-shortand measurement with the Beighton score.
2. The principal researcher will distribute a Google Form containingquestion box regarding personal data and history of injuries and/or fractures that will be sent through the Namarina administration.
3. The principal researcher will record the samples that are the inclusion criteria and exclusion. 4. The principal researcher and research team will come to all Namarina branches. Dance Academy in Jakarta to conduct research on samples that fit the inclusion criteria.
4. Members of the research team will carry out research procedures in accordance with job descriptionwhich has been shared.

STATISTICAL ANALYSIS

Data Analysis Techniques

Univariate Analysis

Univariate analysis is an analysis technique used to one variable that has the purpose of explaining the characteristics of a variables. The analysis was carried out on each of the variables studied, namely age and current dancing level, how long the dancer has been practicing his profession as a dancer ballet dancers, duration of practice per day, frequency of practice performed by dancers for a week, and GJH.

Bivariate Analysis

Bivariate analysis is an analysis that explains the relationship between two variables, namely the independent variable in the form of exercise frequency and the dependent variable is Generalized Hypermobility Joints. The bivariate analysis in this study uses the statistical test method, namely useSpearman Rhowhich has the function of assessing strength and the direction of the relationship between the two variables and analyze the data to determine the result.

Correlation in Spearman rank part of the data used ordinal scale, in statistics using the normality test. Direction The

relationship between variables can be positive or negative. If the value the value obtained is 0.05 then the relationship results are considered has no correlation (Artaya, 2019). The strength of this relationship can be seen from the correlation value obtained. If the correlation value is in the range 0.00 - 0.25 is categorized as a very weak correlation, 0.26 – 0.50 is categorized as sufficient, 0.51 – 0.75 is categorized as in the strong category, 0.76 – 0.9 is categorized as a very strong category, and a value of 1.00 is perfect. If the correlation results obtained have a value of positive, then it can be stated that the two variables have a relationship which is in the same direction (Latief, 2013).

RESULT

Characteristic of sample based on age

The variables analyzed by the researcher were the frequency of exercise (year and week) and GJH. The subjects were ballet dancers at Namarina *Dance Academy* level Grade 5 to *Advance Awarded*. Samples were taken using *purposive sampling* and meet the research inclusion criteria so that as many as 83 samples.

Table of Sample Characteristics based on Age

Age	Frequency (N)	Percentage (%)
11	2	2.4
12	5	6
13	9	10.8
14	10	12
15	5	6
16	13	15.7
17	3	3.6
18	1	1.2
19	5	6
20	4	4.8
21	2	2.4
22	4	4.8
23	6	7.2
24	2	2.4
25	3	3.6
26	1	1.2
28	2	2.4
30	2	2.4
32	1	1.2
34	1	1.2
36	1	1.2
44	1	1.2
Total	83	100

Univariate analysis in the table shows that the subjects who are ballet dancers Namarina *Dance Academy* most are 16 years old, namely as many as 13 people (15.7%), then 14 years old as many as 10 people (12%) from a total of 83 subjects with an average age of dancers in Namria *Dance Academy* namely 17-18 years.

Table of the distribution of the sample characteristics based on the Level or Grade

Level	Frequency (N)	Percentage (%)
Grade 5	7	8.4
Intermediate Foundation	24	28.9
Intermediate	13	15.7
Advance Foundation	11	13.3
Advance 1	8	9.6
Advance 2	11	13.3
Advance Awarded	9	10.8
Total	83	100

Based on the analysis, the subjects who are at the level or Grade 5 class consists of 7 people (8.4%), Intermediate Foundation class consists of 24 people (28.9%), Intermediate totaling 13 people (15.7%), Advance 1 totaling 8 people (9.6%), Advance 2 totaling 11 people (13.3%), and Advance Awarded totaling 9 people (10.8%).

Distribution of Sample Characteristics by Years of Dancing

Year	Frequency (N)	Percentage (%)
6	4	4.8
7	1	1.2
8	7	8.4
9	12	14.5
10	12	14.5
11	13	15.7
12	5	6
13	4	4.8
14	2	2.4
15	4	4.8
20	7	8.4
21	7	8.4
22	1	1.2
23	1	1.2
24	1	1.2
25	1	1.2
30	1	1.2
Total	83	100

Based on the table above, it was found that of the 83 dancers who became respondents, it was found that as many as 13 dancers (15.7%) had done his activities as a dancer for 11 years, each 12 dancers (14.5%) carried out his activities as a dancer for 9 and 10 years.

Distribution of Sample Characteristics based on Exercise Frequency in a week

Exercise Frequency per week	Frequency (N)	Percentage (%)
< 3 times a week	22	26.5
>3 times a week	61	73.5
Total	83	100

Based on the table of distribution table of characteristics of exercise frequency categories during a week carried out by dancers, a total of 22 people (26%) did dance activities less than 3 times a week and a total of 61 (73.5%) dancers doing dance activities or classes more than 3 times a week.

Distribution of Sample Characteristics by Exercise Frequency Categories

Exercise Frequency Categories	Frequency (N)	Percentage (%)
Low	3	3.6
Moderate	22	26.5
Heavy	58	69.9
Total	83	100

Based on the distribution table of sample characteristics based on exercise frequency categories, it was found that 3 people were in the low category (3.6%), 22 people were in the moderate category (26.5%), and as many as 58 people falls into the heavy category (58%).

Sample Characteristics based on *Beighton score*

Beighton Category Score	Frequency (N)	Percentage (%)
Light	4	4.8
Currently	31	37.3
Heavy	48	57.8
Total	83	100

Beighton assessed the hypermobility of joints in dancers, found 4 people were affected by mild hypermobility (4.8%), as many as 31 people were affected by moderate hypermobility (37.3%), and 48 people were affected by severe hypermobility or *Generalized Hypermobility Joints*(57.8%).

Correlation between Exercise Frequency and ***Generalized Hypermobility Joints***

Analysis is used to find out whether there is a relationship between the frequency of exercise on *Generalized Hypermobility Joints* (GJH) with using non-parametric Spearman's rho analysis. The results of the variable analysis test from all subjects can be seen in the following table.

Correlation of Variables	Correlation	p Value
Exercise Frequency	0.439	0.000
Generalized Hypermobility Joint		

Based on the table, the results of the non-parametric Spearman rho test were obtained. The significance value is 0.000 ($p<0.05$) which shows that there is a significant relationship between exercise frequency and GJH in ballet dancers in Namarina. *Dance Academy* Jakarta. The results of this clinical trial also obtained a positive coefficient of 0.439 which can be interpreted that the positive value obtained from this clinical trial shows that there is a unidirectional relationship in the sufficient category of 0.26 — 0.50.

DISCUSSION

Characteristics of Research Subjects

This study examines the relationship between exercise frequency and incident Generalized Hypermobility Joints (GJH) on ballet dancers in NameDance AcademyJakarta. This study uses a research design cross-sectionaland involved 83 ballet dancers fromGrade level5 to Advance Awarded. Samples were taken using the methodpurposive sampling, with strict inclusion criteria. The variables analyzed include frequency of exercise in years and weeks, and the Beighton score which measures level of joint hypermobility. Univariate and bivariate analyses were performed to describe the characteristics of research subjects and to test the relationship between variables.

The distribution of research subjects by age shows significant variation. wide, from 11 to 44 years, with the majority falling in the 16-19 range. years. The research subjects were also spread across various levels of ballet training, with most of them at the Intermediate Foundation level. In addition, The duration of dance training also varies, with the majority having danced for 9 months. up to 12 years. Most dancers practice more than 3 times a week and have a high level of exercise.

This study involved female ballet dancers from Namarina Dance Academy Jakarta, which was selected based on several specific characteristics to ensure the relevance and accuracy of research results. Gender women were chosen because women tend to experience more Generalized Hypermobility Joints (GJH) compared to men. Research previously shown that gender differences play a role significant in the incidence of joint hypermobility, with women being more susceptible to this condition (Kanget al., 2020). In addition, the research subjects consisted of ballet dancer who is at the

levelGrade5 toVocational Grade Advance Awarded, which generally covers the age range of adolescence to young adults. This age group was chosen because they are in the period of intensive training and has a high risk of developing GJH (Timmonset al., 2021).

Only dancers who have more than six years of dancing experience included in this study. This criterion is important to ensure that the research subjects have a fairly intensive training background to allow for the development of GJH due to the frequency and intensity high training. Long training experience provides an illustration more accurate about the impact of training frequency on development GJH. In addition, the research subjects were selected based on Beighton Score ≥ 4, which indicates the presence of joint hypermobility. The use of the Beighton Score ensure that only dancers who have shown signs hypermobility included in the study, so that the relevance between exercise frequency and GJH can be evaluated precisely (I Putu & Suartika, 2018).

The inclusion criteria in this study included female ballet dancers. who has over six years of dancing experience and Beighton Score ≥ 4. Meanwhile, the exclusion criteria include dancers who experience or have a history of serious injury or fracture, such as a hip dislocation or fracture femur. This is done to avoid confounding variables that may affect the research results. With the characteristics of the selected subjects In this careful way, the research aims to obtain samples that are representative in evaluating the relationship between exercise frequency and Generalized Hypermobility Jointsat the ballet dancers in NamarinaDance AcademyJakarta (by Die De Vrieset al., 2022).

Relationship between Exercise Frequency on GJH

Dance physiology involves the body's response to dance training. includes intensity, duration, and frequency of exercise (Bangun. S., et al, 2021). During exercise, muscles need more oxygen and nutrients, and increases the excretion of metabolites and carbon dioxide. Changes This metabolic process involves increased cardiovascular and ventilator activity. to meet the increasing energy needs. Dancers also need good coordination, high kinesthetic awareness, and control balance in their movements. Endurance is very important for continuing a long dance performance, developing spatial awareness, rhythm, and music appreciation (Sustiawati, et al., 2018). In theater dance, dancers must be able to project movements clearly and expressive so that it can be understood by the audience. (Firdaus, et al., 2019, Sabaananth, et al., 2014).

Biomechanics is a scientific discipline that studies mechanical principles. human movement and provides information about muscle function and its characteristics (Arjuni, et al., 2021). In the context of dance, information regarding muscle function can help detect errors during movement and avoid injury. Biomechanical analysis can help dancers understand the root causes of errors in movement and improve their technique. In addition, biomechanical information can help specialists detect exercise excessive or fatigue that has a negative impact on performance and dancer's welfare (Ilham, Z., et al., 2023). Some basic movements in ballet dance that requires an understanding of physiology and biomechanics to executed correctly among others please, relevant, tendu, degenerate, round of jambe on earth, development, arabesque, grand battle, chasse, And jet. MovementThis movement helps warm the body, increases flexibility, train the dancer's balance, muscle control, and leg and body strength (Kuotedakis, 2008).

Generalized Hypermobility Joints (GJH) in ballet dancers is influenced by various factors, including age, gender, type of exercise, frequency and duration of exercise, as well as genetics and collagen (Ganu, et al., 2021). Hypermobility Joint disease is more common in children and

adolescents, and women are more susceptible. experience GJH compared to men. Flexibility training can improve joint mobility, while the exercise done repeatedly over a long period of time can increase range of motion of the joints (Indrawati, et al., 2022). Genetic abnormalities in collagen can also increase the risk of GJH.

This research produces results from non-parametric analysis tests. spearman rhowith a significance value of p = 0.000 (p<0.05) which This means that this research proves that there is a significant relationship between the frequency of exercise and Generalized Hypermobility Joints (GJH) which experienced by ballet dancers in NamarinaDance AcademyJakarta. In addition, A correlation coefficient of 0.439 was also obtained and had a positive value. The value This positive means that the frequency of exercise and GJH have a relationship. in line with a sufficient correlation level of 0.26 – 0.5.

This shows that the more exercises are done in a week and the longer the dancer does his profession, the GJH experienced by dancers will be increasingly difficult. Increasing the frequency of training will significantly be contributed to the development of GJH. Ballet training that intensive and repetitive, especially with high frequency, causes dancers to frequently perform movements that expand the range of motion joint movement beyond normal limits.

This activity, if done consistently over a period of time, long, can result in excessive joint flexibility. According to research by Timmonset al. (2021), ballet dancer with a tight training schedule dense tend to be more susceptible to experiencing GJH compared to those which has a lower frequency of exercise. This is caused by continuous increased pressure and stress on the joints, which can weaken the connective tissue structure and increase the risk hypermobility.

In addition, a study by Kanget al. (2020) revealed that dancers Ballet dancers who experience GJH often show complaints of joint pain and soft tissue injury due to excessive exercise. This condition emphasizes the importance of adjusting the frequency and intensity of exercise to reduce excessive stress on the joints. A balanced approach, including rest time getting enough rest and muscle strengthening exercises is very important prevent the development of GJH and maintain the health of ballet dancers' joints.

The relationship between exercise frequency and generalized joint hypermobility (GJH) in ballet dancers shows several important points. Hypermobility is very common among dancers, which can be an asset to their appearance but also a liability because increases the risk of joint symptoms and injuries. Dancers with hypermobility often experience lower levels of physical fitness and fatigue higher. This is caused by the joints being mechanically hyperlaxed. less stable than stable joints, thus requiring additional muscular effort to achieve stability before movement. This condition causes overuse syndrome, similar to that which occurs in musicians and athletes. the hyperlax.

Apart from the physical aspects, there is evidence to suggest that Hypermobility is also associated with psychological conditions, particularly disorders panic. This relationship may involve genetic factors that influence collagen structure in loose joints. Traditional assessment methods for hypermobility, such as the Beighton and Brighton criteria, are not specifically designed for dancers and may not accurately reflect the unique challenges faced by dancers with hypermobility. Therefore, it is necessary new assessment systems and methods that are more appropriate for evaluating and managing hypermobility in this population.

To prevent injury and maximize potential, dancers with hypermobility should receive special attention and support during training. This includes developing specific training procedures that tailored to their unique abilities, which may involve insights from sports science and practices such as Pilates and yoga that provides precise

anatomical localization of the effect. With proper support, dancers can be effective in the dance genre that best suits their abilities. their uniqueness.

In the long term, a balanced approach to training can be helps ballet dancers achieve optimal performance without sacrificing their health. With good management, the risk of GJH can be minimized, and dancers can enjoy longer, healthier careers. Coaches and dancers must work together to find the right balance. right between exercise intensity and joint health, ensure that every training session contributes positively to career development and physical well-being of dancers.

CONCLUSION

Based on the research results using bivariate analysis, it was produced that there is a relationship between exercise frequency and GJH in ballet dancers in namaria Dance Academy Jakarta with a p value = 0.000 ($p < 0.05$) with a correlation value of 0.439 which indicates a positive direction because the heavier the frequency of training done by a ballet dancer is getting harder also, GJH experienced by dancers.

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