Underlying Criterion for Development of Norms for Beginners in Assessment of Gymnastics Performance

Dona Das Sengupta[1], Dr. Asish Paul[2], Arumoy Jana[3]

[1]Research Scholar, Department of Physical Education, Jadavpur University
&
Assistant Professor, Department of Education, St. Xavier's College (Autonomous), Kolkata
West Bengal,

[2]Associate Professor, Department of Physical Education, Jadavpur University,
West Bengal,

[3]Senior Research Fellow, Department of Physical Education, Jadavpur University

ABSTRACT

Background Context: Gymnastics is a multidimensional sport that requires a high level of physical fitness, determination of mind and skill to succeed. 'Federation Internationale de Gymnastique' (FIG) design norms to assess Gymnastics performance of junior and senior international level competitions which is also followed by 'Gymnastics Federation of India' (GFI) at the national level competitions. FIG permits national federations like GFI modify the design for the other competitions organised at national and local levels till the age of 8 years and above. Coaches and Gymnastics experts agree that Gymnastics can be started at age as early as 4 years but there is no standard norm to assess the performance and checking their development. Before constructing the norms for those ages level of 4-8 years children the underline criteria should be kept in mind for assessment of Gymnastics performance along with gender differences. **Objectives of the study:** To explore the basic criteria for development of 'Code of Points' in Gymnastics. **Methods:** The literature review design has been adopted from different scientific electronic databases such as Google Scholar and Google Advance Search. There after the entire relevant articles have been critically analysed. **Conclusions:** The researches and analysis by numerous scholars have been mainly centered on the cognitive, behavioral, motor ability and their mechanical analyses, fitness of the gymnast and every developing detail in movement preparation according to age and gender. More or less the result of most of the study found that systematic Gymnastics training with respective age increases performance of gymnast.

Keywords: *Gymnastics, Assessment norms, Code of Points, Physical fitness, Motor Creativity, Postural Control, Age and Sex*

INTRODUCTION

Gymnastics is one of the ancient and oldest existing sports. It has its initiation from simple events assessing the ability of a person to run, jump, swim, throw, wrestle, and climb ropes and weight lifting, to a

sport of speed, agility, grace and acrobatics. Moreover, the gymnasts have appeared to be more courageous and stronger, with greater stamina and mental potentiality. In the current era, Gymnastics is often considered as the toughest sport, both physically and mentally. Gymnastics comprises of an immense variety of movements on different apparatus and on the floor and calls for displaying brilliance, greater skill and knowledge and an ability to combine both harmoniously. Furthermore, today's International Elite gymnasts are doing even greater degree of difficult skills and routines with more speed and power. Here are some of the phenomenon's that place gymnasts and Gymnastics at the dominant position of the difficult sports hierarchy in [1]:

- Balance
- Rotation
- Spatial Awareness
- Nine times Body Weight Strength
- Proprioception and Kinesthetic Awareness
- Skill and Routine Timing to Six Thousandths of a Second
- Short Distance Sprint Speed of 16+ (20+ for men) Miles per Hour
- Tumbling and Vault Heights of 13+ (16+ for men) Feet High
- 900 Degrees of Rotation and 360 Degrees (1080 Degrees now being done) of Twisting in Less Than One Second

Inclusion to the above phenomenon there are various other factors where gymnasts must surpass all other athletes are: Strength to Body Weight Ratio; Leg, Back and Shoulder Flexibility; Female Upper Body Strength; Explosive Power; Kinesthetic Air Sense and Awareness; Focus; Concentration; and Pressure Competitions.

Additionally, a gymnast's ability to sustain injury free participation in the sport [2][3]. The coaches, trainers, experts and therapists involved in the sport are able to judge an individual gymnast's physical abilities and overall fitness level as a means of ameliorating healthy, injury-free participation in the sport.

TABLE 1: GYMNASTICS APPARATUS & ELEMENTS FOR DIFFERENT AGE

APPARATUS	FOR 4-UNDER 5YEARS AGE GROUP OR STAGE I	FOR 5-UNDER 6YEARS AGEGROUPOR STAGE II	FOR 6-UNDER 7YEARS AGE GROUP OR STAGE III	FOR 7- UNDER 8YEARS AGE GROUP OR STAGE IV	
				Boys	Girls
Floor exercise (FEx)	Forward roll, Backward roll, Standing arch, Leg split sitting, T-balance (2seconds hold), Handstand (momentary) (1second hold), Jump dive roll <u>For Bonus:</u> From handstand 3/4th turn to cartwheel	Handstand forward roll (with straight arms and legs), Backward roll to handstand (bend arms), Front walkover (both legs together or split legs), Back walkover (both legs together or split legs), Support 'L' hold (for 4 seconds), Running Dive Roll (2 to 3 steps), Cartwheel, <u>For Bonus:</u> Handspring	Backward roll to handstand (with straight arms), Swiss Press (2 seconds hold), 'V' hold (2 seconds hold), Handspring, Round off back flip, Handstand hely turn (for boys), One leg 540˚turn on toe (for girls), Round off straight jump 180˚ turn, <u>For Bonus:</u> Round off back salto, Fly Spring or both leg handspring	Both leg press handstand, (2seconds hold) Handstand roll to endo press handstand, Handstand to straddle backward roll hands and Both leg circle Handspring to dive roll Forward roll to momentary back-flip Handstand to in-turn (Dimedo turn) Jump cartwheel Round off straight jump 180˚turn to dive roll Tuck back salto <u>For Bonus:</u> Both leg press handstand forward roll to endo press handstand and straddle backward roll to handstand Arial cartwheel, Backward salto stretched	Both leg press, Straddle jump, Two leap jumps (pause or take step in between), Handspring to immediate dive roll, Jump 360˚ turn, Jump Cartwheel, Round off straight jump 180˚ turn to dive roll <u>For bonus:</u> Arial cartwheel (instead of Jump Cartwheel), Back salto straight (instead of Round off straight jump 180˚turn to dive roll)
Vaulting Table (VT)	**X**	**X**	**100cm height of VT:** Jump to squat sit then stand to perform handspring from Table, Jump to squat sit then stand to perform pike jump from Table, Jump to squat sit then stand to perform tuck jump from Table	**110cm height of VT:** Handspring, Stoop pike, Stoop tuck	**110cm height of VT:** Handspring, Stoop pike, Stoop tuck

Horizontal Bar (HB)	**X**	**X**	**X**	**7ft height of HB from floor:** Swings (4 times), Kip up, Hip circle backward, Mill circle forward and backward	**X**
Pommel Horse (PH)	**X**	**X**	**X**	**100cm height of PH:** Side swing, One leg circle, Under leg circle, Front support swing, Half circle in to sit, Half circle out, L to dismount <u>For Bonus:</u> Scissor (instead of one leg circle) Full circle (instead of half circle)	**X**
Parallel Bars (PB)	**X**	**X**	**X**	**Standard height:** Hanging swing, Support swing	**X**
Uneven Bars (UB)	**X**	**X**	**X**	**X**	**Standard height:** Swing, Swing to turn 180° <u>For Bonus:</u> Swing to turn 180° changing both the grips

Balancing Beam (BB)	**X**	**X**	**X**	**X**	**110 cm height of BB:** Split sitting (without hand support), One leg balance, 180◦ turn on toe, Long leap jump, Cartwheel dismount, <u>For Bonus:</u> 360◦ turns on toe (instead of 180◦ turn on toe), Round-off dismount (instead of cartwheel dismount)

THE EXISTING EVALUATION METHODS

A. D-Score / Difficulty Score (D-Panel): -

As per the 'Code of Point' of FIG, the Difficulty Score represents what was previously known as the start value and includes difficulty and credit for connections (two high-level skills that are performed in sequence without pause) and element group requirements, which are the basic categories of skills/elements that must be included in a routine. The element group requirements vary by apparatus. This score is determined by the D Panel, which is a two-person panel.

As per 'Code of Point' of FIG, the difficulty score is determined by totalling values for the most difficult skills performed by the gymnast, which includes the dismount. Each skill has a set difficulty value, as outlined in the Code of Points. The difficulty value of a skill or element is not recognized if it fails to meet its technical requirements. Also, credit is also only given once for a skill.

There are several Functions of the D- Panel such as recording the entire program content in symbol notation, evaluate independently, without bias and then jointly determine the D–score content. Discussion is allowed. The D2 judge enters the D- score into the computer or score sheet.

The D-score content includes the Difficulty Value, Composition Requirements and Connection Value and Bonus based on special rules for each apparatus. The D- panel on Vault ensures the correct adherence to the warm-up time. They serve as liaison between the Apparatus Jury and the Apparatus Supervisor. The Apparatus Supervisor will then liaise when necessary with the Superior Jury and different others.

TABLE 2: GENERAL FAULTS AND PENALTIES OBSERVED BY D-PANEL

BY D-PANEL JUDGES						
Faults	**Apparatus**	**Small**	**Medium**	**Large**	**Very Large**	**Remarks**
		0.10	**0.30**	**0.50**	**1.00 or more**	
– Performance of connection with fall	UB, BB, FX					No CV
– Failure to land feet first or in prescribed position from an element	Each time					No DV, CV, CR
– Take-off outside the border markings (entirely outside)	FX					No DV, CV, CR
– Failure to acknowledge D-Panel Judges before and/or after exercise	Gymnast per event		*			From the Final Score
– Spotting assistance *(help)*	UB, BB, FX each time				*	Final Score No DV, CV, CR
– Non-permitted presence of spotter	Gymnast per event			*		From Final Score

* Deductible Score; DV: Difficulty Value; CV: Connection Value; CR: Composition Requirement

Specific Deduction: There is also Composition/Special requirement which are those skills that a gymnast must perform in his/her routine. The judges determine the D-score after considering the values of the special requirement. If a gymnast does not perform the required number of special requirement skills, then, it is considered as *Short Routine or Short Exercise*. The total value of the D-score reduces from 10 points, depending on the short exercises.

B. E-Score / Execution Score (E-Panel): -

As per the 'Code of Point' of FIG, the Execution Scores are evaluated by judges of E Panel, from the score of 10.00 points. Deductions are made for errors and faults in technique and execution. There are different **Functions of the E- Panel such as** Observation, evaluation and apply the corresponding deductions correctly, independently and without consulting the other judges.

Determining the final E-Score: All the judges on the E Panel freely ascertain his/her score. The highest and lowest scores are dismissed and the gymnast's execution score is the average of the remaining three judges' scores.

TABLE 3: GENERAL FAULTS AND PENALTIES OBSERVED BY E-PANEL

BY E-PANEL JUDGES				
Faults	**Small**	**Medium**	**Large**	**Very Large**
	0.10	**0.30**	**0.50**	**1.00 or more**
EXECUTIVE FAULTS (for each time)				
– Bent arms or bent knees	*	*	*	
– Leg or knee separations	*	* shoulder with or more		
– Legs crossed during elements with twist	*			
– Insufficient height of elements *(external amplitude)*	*	*		
Insufficient – exactness of tuck or pike position in single salto	* 90^0 Hip angle	* > 90 degree Hip angle		
– Failure to maintain stretched body posture (*piking too early)*	*	*		
– Hesitation during performance of elements & movements	*			
– Attempt without performance of an element (*empty run)*		*		
– Deviation from straight direction	*			
Body and/or leg position in elements *(non-dance)* ─ Body alignment – Feet not pointed/relaxed – Insufficient split in acro elements *(non-flight)*	* * *	*		
─ Failure to fulfil technical requirements in dance elements	*	*	*	
– Precision	*			
– Performance of Dismount too close to the apparatus *(UB & BB)*		*		
LANDING FAULTS (all elements including dismounts)	If there is no fall the maximum landing deduction may not exceed 0.80			
– Legs apart on landing	*			
– Extra arm swings	*			
– Lack of balance	*	*		
– Extra steps, slight hop	*			
– Very large step or jump *(guideline – more than 1 meter)*		*		
– Body posture fault	*	*		
– Deep squat			*	
– Support on mat/apparatus with 1 or 2 hands				1.00
– Fall on mat to knees or hips				1.00
– Fall on or against apparatus				1.00
– Failure to land feet first on landing from element				1.00

* Deductible Score

EXAMPLE: CALCULATION OF THE FINAL SCORE

D- Score:	(DV) Difficulty (3 C, 3 D, 2 E)	+ 3.10
	(CR) Composition Requirements	+ 2.00
	(CV) Connection Value	+ 0.60
D- Score		**5.70**

E- Score*		10.00
Execution	0.70	
Artistry	0.30	
	- 1.00	
E- Score		**9.00**

***E- Score** Sum of the execution & artistry deductions are added together and then subtracted from 10.00 E-score is calculated by averaging the middle 3 of 5 scores (deductions)*

Final Score = D- Score + E- Score

Final Score = 5.70 + 9.00 = 14.70 Points

UNDERLYING FACTORS

High skilled exhibit a better estimation of body tilt, tilt angles varied as a function of rotation axis but in case of visual information remains almost same because sensory system develop by spatial orientation ability and increased interacting sensory information [4]. Eight session Gymnastics practice had significant increase in the amplitude of the swing but behaviour of the beginners is highly constructed by the dynamic of the system [5]. Consistency in practice increase and stabilised the coordination mode and behavioural repertoire [6]. Adaptive movement variability is key factor for developing motor creativity; manipulate adaptive movement variability for complex motor creativity [7][8]. Fundamental movement skills were corrected by combined artistic Gymnastics and physical activity in school going children [9][10]. Visual information increases postural control then without visual information in younger gymnast. The velocity of centre of pressure in medial lateral was less in younger gymnast than younger non gymnast [11]. Postural control is less in younger (8-10) age than 12-24 age group, but systematic and specific training influence more postural control reflect in adult Gymnastics [12]. Experience in specific posture modifies coordinative ability and regulates postures [13]. Recreational Gymnastics can be effective method for enhancement of motor proficiency in early childhood [14]. Backward stretched somersault with or without rotation around the longitudinal axis facilitate acrobatic Gymnastics performance and round off, flic-flac technique may help to going highest during backward somersault skills [15]. The greater amount of physical activity had better work memory performance in respect to response accuracy and speed [16]. Not only standard physical education

curriculum but Gymnastics base physical activity has better effect upon movement skill on children from grades 2, 4, 6 [17]. In the field of biomechanical research very few studies generalised biomechanical issues in Gymnastics in terms of various dimensional image site, frame rate needs to justify for develop Gymnastics movement [18]. Biomechanical analyses in Gymnastic technique help to learn technical elements in preparatory phase of women artistic Gymnastics [19]. Gymnastics competition of different levels were inferior at vault and floor apparatuses [20]. The best landing has symmetric between both legs for that symmetrisation need to develop enough height, higher angular momentum around transverse and longitudinal axis and control of angular velocity in the longitudinal axis [21]. Artistic Gymnastics training indicator model, physical quality indicator model, physical fitness indicator model combined helps to identify the problems in training and improve the training effect. Along with historical model data can check and verify the improvement in training and performance [22]. 12 weeks Gymnastics training improves balance ability of 4-6 years both genders of age pre-school children [23].

SUMMARY

Various studies from different arena have attempted to find the best approaches to improve Artistic Gymnastics training impact. The researches and analysis by numerous scholars have been mainly centered on the cognitive, behavioral, postural control, their mechanical analyses, fitness of the gymnast and every developing detail in movement preparation according to age and gender. More or less the results of most of the study found that systematic Gymnastics training with respective age and gender increases performance of gymnast. However, experts should follow the above-mentioned criteria as norms for 'Code of Points' for the beginners in Gymnastics in order to enhance the progression of future elite gymnasts.

REFERENCES

1. Science Shows Gymnastics is the Hardest Sport in the World. (2016, February 06). Retrieved from https://pacificwestgymnastics.com/news/science-shows-gymnastics-is-the-hardest-sport-in-the-world-2/
2. Daly, R.M., Bass, S.L., Finch, C.F. (2001). Balancing the risk of injury to gymnasts: how effective are the counter measures? *British Journal of Sports Medicine*, 35(1):8–18.
3. Sands, W.A. (2000). Injury prevention in women's Gymnastics. *Sports Medicine, 30(5):359–373.*
4. Heinen, T., Walter, N., Hennig, L. & Jeraj, D. (2018). Spatial Perception of Whole-Body Orientation Depends on Gymnasts' Expertise. *Science of Gymnastics Journal.* Vol. 10(1):5 – 15.
5. Delignieres, D., Nourrit, D., Sioud, R., Leroyer, P., Zattara, M. & Micallef, J. P. (1998). Preferred Coordination Modes in the First Steps of the Learning of a Complex Gymnastics Skill. *Human Movement Science.* 17. 221-241.
6. Lucas, D. N., Zelic, Z., Deschamps, T., Hilpron, M. & Delignières, D. (2014). Persistent Coordination Patterns in a Complex Task after 10 Years Delay. *Human Movement Science*, Elsevier, 32, pp.1365-1378.
7. Orth, D., Kamp, J., Memmert, D. & Savelsbergh, G. (2017). Creative Motor Actions as Emerging from Movement Variability. *Frontiers in psychology*, *8*, 1903. doi:10.3389/fpsyg.2017.01903.
8. Carrick, F. R., Oggero, E., Pagnacco, G., Brock, J. B. &Arikan, T. (2007). Posturographic Testing and Motor Learning Predictability in Gymnasts. *DisabilRehabil*, 29(24), 1881-1889.

9. Culjak, Z., Miletic, D., Kalinski, S. D., Kezic, A. & Zuvela, F. (2014). Fundamental Movement Skills Development under the Influence of a Gymnastics Program and Everyday Physical Activity in Seven- Year- Old Children. *Iranian journal of pediatrics*, *24*(2), 124-30.
10. Rudd J.R., Barnett L.M., Farrow D., Berry J., Borkoles E. & Polman R. (2017). Effectiveness of a 16 Week Gymnastics Curriculum at Developing Movement Competence in Children. *Journal of Science and Medicine in Sport*, 20 (2), pp. 164-169.
11. Garcia, C., José, Barela, J. A., Viana, A. R., Barela, A. M. F. (2011). Influence of Gymnastics Training on the Development of Postural Control. Neuroscience Letters. Elsevier. Vol. 492(1).: 29-32.
12. Kochanowicz, A., Kochanowicz, K., Niesppodzinski, B., Mieszkowski, J. & Sawicki, P. (2017). Effects of Systematic Gymnastics Training on Postural Control in Young and Adult Men. *Science of Gymnastics Journal*. Vol. 9(1): 5-15.
13. Gautier, G., Thouvarecq, R. & Larue, J. (2008). Influence of Experience on Postural Control: Effect of Expertise in Gymnastics. *J Mot Behav*. Sep: 40(5):400-8.
14. Karachle, N., Dania, A. & Venetsanou, F. (2017). Effects of a Recreational Gymnastics Program on the Motor Proficiency of Young Children. *Science of Gymnastics Journal*. Vol. 9(1). Pp. 17-25.
15. Mkaouer, B., Jemni, M., Amara, S., Chaabène, H., & Tabka, Z. (2013). Kinematic and Kinetic Analysis of Two Gymnastics Acrobatic Series to Performing the Backward Stretched Somersault. *Journal of human kinetics*, *37*, 17-26.
16. Hsieh, S. Fung, D. Heng, T., Chang, Y. K., Huang, C. & Hung, T. (2018). Differences in Working Memory as a Function of Physical Activity in Children. Neuropsychology. 32.797-808.
17. Rudd, J. (2016). The Efficacy of Gymnastics to Improve Movement Skill Competence in Children. *Institute of Sport, Exercise and Active Living College of Sport and Exercise Science, Victoria University*.
18. Prassas, S., Kwon, Young-Hoo & Sands, W. A. (2006). Biomechanical research in artistic Gymnastics: A review. Sports biomechanics. *International Society of Biomechanics in Sports*. 5. 261-91.
19. Vladimir, P., Marian, C. & Olivia, T. (2013). Learning and Transfer in Women's Artistic Gymnastics. *Procedia - Social and Behavioral Sciences*. 93. 23-28.
20. Pajek, M. B., et al. (2013). "Is the quality of judging in women artistic Gymnastics equivalent at major competitions of different levels?" *Journal of human kinetics.* vol. 37 173-81.
21. Cuk, I. & Marinšek, M. (2013). Landing quality in artistic Gymnastics is related to landing symmetry. *Biology of sport*, *30*(1), 29–33.
22. Luo, L. & Sun, X. (2017). Research on Artistic Gymnastics Training Guidance model. *AIP Conference Proceedings 1829,* 020028 (2017).
23. Akin, M. (2013). Effect of Gymnastics training on dynamic balance abilities in 4-6 years of age children. *International Journal of Academic Research*. 5. 142-146.