

Factor Structural Study on Mental Toughness of Men Softball Pitchers

Amal C. H. and Manoj K.P

University of Calicut, Kerala

The study was to identify key factors influencing Mental Toughness among university level men softball pitchers. Eight subjects were tested on seven sub-variables of Mental Toughness namely Self-confidence, Negative energy control, Attention control, Visual and imagery control, Motivation level, Positive energy control and Attitude control. Three factors were extracted after principal component analysis. Varimax rotation was used to refine the factors and only those factors with loadings greater than or equal to 0.60 were selected. Factor One was named as the Self-confidence factor which accounted for 59.364% of the total common factor and included Self-confidence, Attitude control, Visual and imagery control, Positive energy control, and Motivation level. Factor Two, the Attention control factor, accounted for 22.154% of the common factor and was characterized by only Attention control. Factor Three, the Negative energy control factor, accounted for 15.706% of the common factor and characterized by only Negative energy control.

Keywords: Softball, Pitchers, Mental toughness

While participating in competitive sports (Parry, 2022), athletes need to have a significant level of skill (Skill, 2023) as well as Mental strength (Abernethy, 2005). Participation in a competition requires strenuous, excruciating physical effort (Carling et al., 2009), absolute Concentration and, absorption and supreme Emotional control (Gross, 1999) Will power, and high levels of Motivation (Wong, 2000). People puts their abilities to the test in competitions, and at times pushes themselves to the limit of what is possible for a homo-sapiens (Tattersall, 2023), in an effort to achieve success or excellence in sports/ games. No matter what kind of involvement it is, whether it is recreational (Simmons & Moore, 2016) or competitive, the ultimate benefit is the joy that is gained from either the accomplishment of the activity or simply the act of taking part in the activity itself.

Mental toughness is a narrow plastic personality trait which explains in large part

how individuals respond differently to the same or similar stressors, pressures, opportunities and challenges, irrespective of prevailing circumstances (Clough and Strycharczyk, 2015).It calls for traits like resiliency, tenacity, and a positive outlook in the face of difficulty. Those that are mentally tough are better capable of handling stress, cope with anxiety and do control their emotions. Also, they have a higher chance of success in hard occupations or competitive sports. In point of fact, Gould, Dieffenbach, and Moffett (2002) found that Mental toughness was the mental skill factor that was most frequently cited as a significant contributor to sports performance enhancement.

The concept of Mental toughness refers to a group of qualities that include a relatively high level of determination, the ability to maintain optimal arousal during a competition, an unwavering will to compete despite injury, and a steadfast attitude in the

face of defeat. (Cashmore, 2002, Crust et al., 2014). According to some study, mental skills are a psychological concept that distinguishes between higher and low performance in a variety of sports. Rugby league players performed much better on two of the seven mental toughness sub domains (Golby&Sheard, 2004).It was discovered that Kabaddi players who had stronger self-confidence were much more successful (Patel et al., 2011). Thomas et al. (1996) examined psychological characteristics in ten-pin bowlers of different ability levels. Skilled bowlers were reported more mental toughness, enhanced planning and evaluation skills, more consistency, a stronger commitment to self-improvement, reduced reliance on luck attributions, greater confidence in their equipment and technique, and higher levels of competitiveness. Ones et al. (2002) and (Thelwell et al., 2005) reported that mentally tough soccer players seek the ball at all times. Mental toughness in a specific sport / game may do be affected by task demands.

The sport of softball (Potter D. L. & Johnson L. V., 2007) evolved into a highly competitive activity that requires players to maintain a high degree of physical fitness (Caspersen et.al, 1985). The various softball skills, do have their own unique set of physical requirements to fulfil. Players in the sport of softball, regardless of gender, are expected to have high levels of muscular strength (Corbin et al., 2008), agility (Corbin et al., 2008), and cardiovascular endurance (Farley et al., 2020). One must possess at least some level of physical prowess to fulfil the fundamental prerequisite for performing individual techniques. The game calls for rapid, unexpected bursts of movement together with speed and quick reaction time.

The ability to have a strong sense of space and time, good sight and reflex action, confidence, motivation, visualisation, tough

mentality, and other similar traits are some of the psychological requirements to become a good softball player. Since no previous research has been done on Mental toughness among softball pitchers and in order to find out the most prominent factors of Mental toughness among university-level men softball pitchers, the researchers took up this study on Mental toughness sub-variables that are prevalent among university-level men pitchers.

Method

The purpose of the study was to find out the prominent Mental Toughness sub-variables contributing to performance among University men Softball pitchers in Kerala. The study was done on eight men Softball pitchers of age between 18 to 25 years who have represented any of the universities in Kerala state. The tool selected for this study was the Psychological Performance Inventory (PPI) developed by James E, Loehr (1982). The selected Mental toughness sub-variables were Self-confidence, Negative energy control, Attention control, Visual and imagery control, Motivation level, Positive energy control and Attitude control.

Factor analysis is a procedure to identify those linear combinations of variables (called as factors), which have large variances, ignoring the linear combination, which have small variances. Factor analysis was applied to investigate the dominant factors among the selected Mental toughness sub-variables and for doing so, the Principal Component Analysis method have been used and the final solution was obtained by rotating the extracted unloaded factors using Varimax solution.

Results

Scores on all the seven sub- variables of Mental toughness of university level men Softball pitchers were subjected to correlation analysis which was used in the

principal component analysis. With the help of principal component analysis, all the seven sub-variables were divided into various factors and with the help of Kaiser's criteria (1959) suggested by Guttman(1954), only those factors having Eigen values greater than one were considered as common factors. Owing to this criteria, three factors were retained. The findings of the study are detailed below:-

Table 1. Principal component analysis of men softball pitchers of Kerala (un-rotated factor loadings)

	Factor 1	Factor 2	Factor 3
Eigen value	4.155	1.551	1.099
Total Variance Exp	59.364	22.154	15.706
Cum. Variance Exp	59.364	81.518	97.224
Self-confidence	0.901	0.423	0.080
Negative energy control	0.346	-0.428	0.833
Attention control	-0.264	0.892	0.331
Visual and imagery control	0.862	0.214	-0.456
Motivation level	0.913	-0.308	-0.151
Positive energy control	0.929	-0.275	0.067
Attitude control	0.846	0.419	0.232

The unloaded factors obtained were then rotated by varimax method to find the final solutions. Rotation of the factors is important in order to avoid the overlapping of sub-variables in different factors.

Table 2. Principal component analysis of men softball pitchers of Kerala (rotated factor loadings)

	Factor 1	Factor 2	Factor 3	Communalities
Eigen value	4.155	1.551	1.099	-
Total Variance Exp	59.364	22.154	15.706	-
% Variance Exp	59.364	81.518	97.224	-

Self-confidence	0.988	-0.090	0.114	0.997
Negative energy control	0.098	0.131	0.985	0.997
Attention control	0.088	-0.981	-0.079	0.976
Visual and imagery control	0.903	0.297	-0.306	0.997
Motivation level	0.726	0.628	0.171	0.951
Positive energy control	0.740	0.516	0.360	0.943
Attitude control	0.927	-0.167	0.241	0.945

Items with loading greater than or equal to ± 0.60 of varimax solution were selected for discussing each factor. Thus three factors were extracted and each of the three factors obtained were interpreted and given names.

Table 3. Factor one of men softball pitchers of Kerala after rotated factor loadings (varimax solution)

Item No.	Name of the variables	Factor loadings
1	Self-confidence	0.988
7	Attitude control	0.927
4	Visual and imagery control	0.903
6	Positive energy control	0.740
5	Motivation level	0.726

The Factor 1 of male softball pitchers in table 3 was characterized by five sub-variables from among the selected seven sub-variables namely Self-confidence, Attitude control, Visual and imagery control, Positive energy control and Motivation level. Since, Self-confidence is found to have the highest loadings, this factor can be called as the Self-confidence factor. This factor accounted for 59.364% of the total common factor accounted by all the three factors.

Table 4. Factor two of men softball pitchers of Kerala after rotated factor loadings (varimax solution)

Item No.	Name of the variables	Factor loadings
3	Attention control	-0.981

Factor two of male softball pitchers in table 4 was characterized by only one variable, Attention control extracted from among the selected seven sub-variables. As Attention control is found to be the only extracted item, this factor can be called as the Attention control factor. This factor accounted for 22.154% of the total common factor accounted by all the three extracted factors.

Table 5. Factor three of men softball pitchers of Kerala after rotated factor loadings (varimax solution)

Item No.	Name of the variables	Factor loadings
4	Negative energy control	0.985

Factor 3 of male softball pitchers in table 5 was characterized by only one sub-variable the Negative Energy control extracted from among the selected seven sub-variables. As Negative energy control is found to be the only extracted item, this factor can be called as the Negative energy control factor. This factor accounted for 15.706% of the total common factor accounted by all the three factors.

Discussion

The factor analysis on Mental Toughness among Softball pitchers revealed that Factor 1 comprises Self-confidence as the heavily loaded item, Factor 2 comprising of Attention control as the heavily loaded item, and Factor 3 comprising of Negative energy control as the heavily loaded item.

In line with previous research, the findings revealed Self-confidence as the most important factor among male Softball pitchers, this finding agrees with the findings of (Lochbaum et al., 2022) which revealed that Self-confidence plays a crucial role in the performance of athletes about their athletic performance. According to Vealey et al. (1998) and Feltz, (1988), Self-confidence is one of the most important psychological factor and optimum levels of confidence are

required for high achievement. The level of Self-confidence of athletes has been a major predictor of their performance and hence it can be said that success in softball pitching is largely determined by Self-confidence.

Pitchers in softball are often seen as the leaders of the team, and their confidence can affect the morale of the entire team. A pitcher exudes confidence and motivates his teammates to perform better, resulting in a more cohesive and motivated team. Softball pitching can be mentally taxing, especially in stressful situations such as critical innings or during a crucial match/game. Confidence helps pitchers to maintain Mental toughness and composure, so they can focus and perform well even in the face of adversity and failure. This game often involves high-risks situations wherein, a single pitch can make a significant change in the result. With self-confidence, pitchers can handle pressure more efficiently, perform well under stress, and deliver crucial pitches at times of need. Hence, Self-confidence is an important psychological characteristic that has a direct impact on a softball pitcher's performance, decision-making abilities, leadership qualities, and capacity to manage pressure efficiently. Pitchers maximise their potential and have a huge effect on the team's performance by developing self-confidence via good coaching, encouragement, and mental skills training.

Among male softball pitchers, the second factor which only yielded Attention control as a significant item, do indicates that, concentrating and maintaining attention as important psychological characteristics. Previous studies have shown that, athletic achievement depends heavily on Attention control across a wide range of sports disciplines (Draheim et al., 2022; Ducrocq et al., 2016). In this study, attentional processes were found to contribute significantly to Softball pitcher's overall athletic performance. As evidenced by the relatively high variance

of Attention control (22.154%), and this findings being supported by the findings of other researchers, in order to enhance the pitching performance, coaches and trainers should incorporate concentration training techniques such a meditation, Yoga and other relaxation techniques to better Attention control into their training regimes.

Pitchers with better attention control can focus on the responsibility at hand, resulting in more precise and accurate pitching. Pitchers may regularly hit their spots and make it difficult for hitters to make meaningful contact by paying close attention to their technique and pitching point / location. Besides, this also enables pitchers to closely examine and analyse opposition player's hitting habits. Pitcher showing better Attention control and who can change their pitches tactically by paying attention to the batter's stance, swing, and habits, exposing vulnerabilities thereby increasing their chances of making the batter out. Softball games are filled with distractions, such as crowd noise, base runners attempting to steal, and fielders running around. Pitchers, who has better attention control will be able to block all these distractions and stay focused on the pitch they are about to deliver.

The finding of the study suggests that regulating Negative energy is crucial for male softball pitchers. There is extensive evidence regarding the detrimental impact of negative emotions on athletic performances, as a result, Emotional regulation skills will potentially improve performance. The aforementioned finding is in consensus with previous research findings that emphasise the importance of Emotional regulation in athletic performances. (Gross, 1998; Lazarus, 2000).

Controlling negative energy is about managing and coping with negative emotions such as frustration, anger, fear or self-doubt. Softball pitchers are often under high

pressure and suffer setbacks during games. There is a possibility that a pitcher's emotions can fluctuate during the course of a game, affecting his / her performance and it can be contagious also, which may spread to other team members if not managed efficiently. Hence, effective Negative energy control allows pitchers to manage these emotions constructively and prevent them from negative impacts on themselves and on the whole team's performance.

A pitcher's ability to control the ball is crucial to success in softball. With control, a pitcher is in command, and as a result, a pitcher becomes more confident, poised, and focused on the pitcher plate. The ability to perform at elite levels under pressure is greatly enhanced with proper control and this improves a pitcher's ability to execute a strategic game plan. The ability to place a pitch both inside and outside the strike zone usually determines victory or defeat. Clever pitchers with precise control can effectively keep hitters at bay or put them in a difficult position. Most often, pitchers receive heaps of praise for a team's success and sometimes all the blame for a team's debacle. Therefore, Softball pitchers need Self-confidence, Attention control and Negative energy control for effective pitching and success in a game / match.

Conclusion

The following conclusions were drawn from the present study applicable to male Softball pitchers.

1. The self factor characterized by only Attention control was the second most prominent Principal component factor among male Softball pitchers.
2. The Attention control factor characterized by only Attention control was the second most prominent Principal component factor among male Softball pitchers.

3. The negative energy control factor comprising of only Negative energy control was found to be the third most significant factor and was named as Negative energy control factor.

References

- Abernethy, I. (2005, August 1). *Mental Strength* (1st ed.). NETH Publishing.
- Carling, C., Gall, F. L., & Reilly, T. P. (2009, December 18). Effects of Physical Efforts on Injury in Elite Soccer. *International Journal of Sports Medicine*, 31(03), 180–185. <https://doi.org/10.1055/s-0029-1241212>
- Cashmore, E. (2002). *Sport Psychology: The Key Concepts* GV706. 4. C268 2002. Routledge.
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports (Washington, D.C. : 1974)*, 100(2), 126–131.
- Clough, P., & Strycharczyk, D. (2012). *Developing mental toughness: Improving performance, wellbeing and positive behaviour in others*. Kogan Sage Publishers.
- Corbin, C., Welk, G. J., Corbin, W., Welk, K., & Corbin, W. R. (2008, November 11). *Concepts of Physical Fitness: Active Lifestyles for Wellness*. <https://doi.org/10.1604/9780073376394>
- Crust, L., Earle, K., Perry, J., Earle, F., Clough, A., & Clough, P. J. (2014, October). Mental toughness in higher education: Relationships with achievement and progression in first-year university sports students. *Personality and Individual Differences*, 69, 87–91. <https://doi.org/10.1016/j.paid.2014.05.016>
- Draheim, C., Pak, R., Draheim, A. A., & Engle, R. W. (2022, February 15). The role of attention control in complex real-world tasks. *Psychonomic Bulletin & Review*, 29(4), 1143–1197. <https://doi.org/10.3758/s13423-021-02052-2>
- Ducrocq, E., Wilson, M., Vine, S., & Derakshan, N. (2016, October). Training Attentional Control Improves Cognitive and Motor Task Performance. *Journal of Sport and Exercise Psychology*, 38(5), 521–533. <https://doi.org/10.1123/jsep.2016-0052>
- Farley, J. B., Stein, J., Keogh, J. W. L., Woods, C. T., & Milne, N. (2020, April 15). The Relationship Between Physical Fitness Qualities and Sport-Specific Technical Skills in Female, Team-Based Ball Players: A Systematic Review. *Sports Medicine - Open*, 6(1). <https://doi.org/10.1186/s40798-020-00245-y>
- FELTZ, D. L. (1988). Self-Confidence and Sports Performance. *Exercise and Sport Sciences Reviews*, 16, 423–458. <https://doi.org/10.1249/00003677-198800160-00016>
- Golby, J., & Sheard, M. (2004, October). Mental toughness and hardiness at different levels of rugby league. *Personality and Individual Differences*, 37(5), 933–942. <https://doi.org/10.1016/j.paid.2003.10.015>
- Gould, D., Dieffenbach, K., & Moffett, A. (2002, January 1). Psychological characteristics and their development in Olympic Champions. *Journal of Applied Sport Psychology*, 14(3), 172–204. <https://doi.org/10.1080/10413200290103482>
- Gross, J. J. (1998, September). The Emerging Field of Emotion Regulation: An Integrative Review. *Review of General Psychology*, 2(3), 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Gross, J. J. (1999). Emotion Regulation: Past, Present, Future. *Cognition & Emotion*, 13, 551–573. <http://dx.doi.org/10.1080/026999399379186>
- Guttman, L. (1954, June). Some necessary conditions for common-factor analysis. *Psychometrika*, 19(2), 149–161. <https://doi.org/10.1007/bf02289162>
- Jones, G., Hanton, S., & Connaughton, D. (2002, January 1). What Is This Thing Called

- Mental Toughness? An Investigation of Elite Sport Performers. *Journal of Applied Sport Psychology*, 14(3), 205–218. <https://doi.org/10.1080/10413200290103509>
- Kaiser, H. F. (1959, October). Computer Program for Varimax Rotation in Factor Analysis. *Educational and Psychological Measurement*, 19(3), 413–420. <https://doi.org/10.1177/001316445901900314>
- Lazarus, R. S. (2000, September). How Emotions influence performance in competitive Sports. *The Sport Psychologist*, 14(3), 229–252. <https://doi.org/10.1123/tsp.14.3.229>
- Lochbaum, M., Sherburn, M., Sisneros, C., Cooper, S., Lane, A. M., & Terry, P. C. (2022, May 24). Revisiting the Self-Confidence and Sport Performance Relationship: A Systematic Review with Meta-Analysis. *International Journal of Environmental Research and Public Health*, 19(11), 6381. <https://doi.org/10.3390/ijerph19116381>
- Loehr, J. (1982). *Mental toughness training for sports: Achieving athletic excellence*. Plume
- Parry, J. (2022, May 25). On the definition of Sport. *Sport, Ethics and Philosophy*, 17(1), 49–57. <https://doi.org/10.1080/17511321.2022.2077814>
- Patel, D. S., Pandey, U., & Saxena, S. (2011, October 1). Comparative study of Mental Toughness among Kabaddi players of different level. *Indian Journal of Applied Research*, 1(3), 201–202. <https://doi.org/10.15373/2249555x/dec2011/69>
- Potter D. L. & Johnson L. V. (2007). *Softball : steps to success* (3rd ed.). Human Kinetics.
- Simmons, D., & Moore, K. (2016). Recreation. *Encyclopedia of Tourism*, 777–780. https://doi.org/10.1007/978-3-319-01384-8_299
- skill. (2023, May 24). SKILL | English Meaning - Cambridge Dictionary. <https://dictionary.cambridge.org/dictionary/english/skill>
- Tattersall, I. (2023, June 27). Homo-sapiens. Encyclopedia Britannica. <https://www.britannica.com/topic/Homo-sapiens>
- Thelwell, R., Weston, N., & Greenlees, I. (2005, December). Defining and Understanding Mental toughness within Soccer. *Journal of Applied Sport Psychology*, 17(4), 326–332. <https://doi.org/10.1080/10413200500313636>
- Thomas, P. R., Schlinker, P. J., & Over, R. (1996, June). Psychological and psychomotor skills associated with prowess at ten pin bowling. *Journal of Sports Sciences*, 14(3), 255–268. <https://doi.org/10.1080/02640419608727709>
- Vealey, R. S., Garner-Holman, M., Hayashi, S. W., & Giacobbi, P. (1998, March). Sources of Sport-Confidence: Conceptualization and Instrument Development. *Journal of Sport and Exercise Psychology*, 20(1), 54–80. <https://doi.org/10.1123/jsep.20.1.54>
- Wong, R. (2000, July 3). *Motivation: A Biobehavioural Approach*. <https://doi.org/10.1604/9780521561754>

Amal C. H., Research Scholar, Department of Physical Education, University of Calicut, Kerala

Manoj K. P., PhD, University Director, Department of Physical Education, University of Calicut, Kerala