Anxiety status of junior archers in COVID-19 during training isolation period towards the shooting performance

Wan Nurlisa Wan Ahmad[1,2], Mohd Azrul Hisham Bin Mohd Adib[2], Irdayanti Mat Nashir[1]
Mon Redee Sut Txi[3], Fatin Nurfatehah Mat Salleh[3], Jing Rui Tang [1]

[1]Department of Engineering Technology, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris, Perak, Malaysia
[2]Department of Mechanical Engineering, Medical Engineering and Health Intervention Team (MedHiT), College of Engineering, Universiti Malaysia Pahang, Malaysia
[3]Department of Sport Science, Faculty of Sports Sciences and Coaching, Universiti Pendidikan Sultan Idris, Malaysia

Article Info

ABSTRACT

Studies have indicated that the COVID-19 pandemic has had miserable effects on athlete performance due to the movement control order (MCO) announced by the Malaysia Government. Dealing with self-training without the coach's guidance leads the archers to lose concentration, diminished self-confidence, and elevated anxiety levels. These factors contribute to inconsistent shooting performance. This study attempted to identify the archer's anxiety status during the training isolation period on the shooting performance. A total of 32 participants from the recurve archery category were recruited and enrolled in a web-based cross-sectional study during the MCO. The CSAI-2R instrument was applied to participants to examine the psychological aspect. Training Isolation resulted in a significant effect on anxiety status and shooting performance. Analysis from CSAI-2R, low-level archers, indicated 5% more anxiety than top-level archers for both cognitive and somatic anxiety sub-component. In contrast, Top archers revealed a higher self-confidence mean of 2.32 (moderately high) than low archers (1.38). The result shows improvement in anxiety and score performance with complete online monitoring and coaching supervision first session until the 8th session. These findings could assist sports institutions in improving a better training experience and understanding the pandemic's impact on athletes' mental health during home isolation.

This is an open access article under the [CC BY-SA](#) license.

Corresponding Author:

Wan Nurlisa Wan Ahmad
Department of Engineering Technology, Faculty of Technical and Vocational
Universiti Pendidikan Sultan Idris
Perak, Malaysia
Email: nurlisa@ftv.upsi.edu.my

1. INTRODUCTION

At the moment of typing, in the middle of March 2022, nearly 450 million people worldwide had been contracted this severe and rapidly spreading disease, which has paralyzed economies and normal daily activities in many cases. Athletes are among the people that have been badly affected by this pandemic, as the sudden movement control order (MCO) has led to the training centre and school closure. Hence, athletes cannot proceed with their regular training routine and must be extra vigilant in dealing with the pandemic [1]. During the MCO period, athletes depend heavily on self-training and require appropriate guidance from the coaches to maintain their psychological and physiological fitness [2]. A study in Canada stated that lockdown situations mediated changes in athlete training schedules, especially with not conducive environments, different rhythms

in training activities and physical changes [3], [4]. This situation harms athletes' mental condition and health [5]. In the latest survey from Washif *et al.* [6], more than 50% of 12,526 athletes wanted remote coaching (online synchronous) during their training session with the coach's guidance. The announcement of MCO showed the athlete facing difficulty in training alone, hindering athlete concentration due to lack of resources such as equipment, tools, facilities, space, and encourage team from friends. This problem results in inconsistency, and athlete anxiety status worsens when measuring their scoring performance [7], [8].

Archery is a precision sport, the required skill of shooting arrows with a bow. High-performance shooting in archery experiences accurately shooting an arrow at a specific [9]. Archery is a highly-skilled, non-contact, individual static sport that has recently grown in popularity [10], [11]. The phases of the archer cycle in archery are pre-shot, set-up, draw, aiming, clicker release time, and follow-through when the archer is positioned on the shooting line [11], [12]. Those steps required consistent training to maintain athlete discipline and attitude during games. Kuan and kueh [13] presented the concept of archer's performance determinants. The author has discussed various contributing elements that may increase or decrease an archer's performance during training or competition. Anxiety is a negative emotional state that can negatively impact an athlete's performance by causing cognitive and physiological symptoms [14]. Cognitive anxiety can be described as negative expectations and fears about performance, inability to concentrate, interrupted attention, and possible failure consequences and those thoughts tend to inhibit performance [15], [16].

In contrast, the physiological effects of somatic anxiety include sweaty hands, tense muscles, shortness of breath, elevated heart rate, butterflies in the stomach, and shakiness. Somatic anxiety is distinguished by an individual's perceptions [17], [18]. Multidimensional anxiety theory (MAT) is based on distinguishing two components of anxiety which are cognitive and somatic anxiety. According to this idea, these components impact performance [19]. Most past studies have concentrated on elite athletes while disregarding those with less success [20]. Athletes of varying ability levels will exhibit competitive anxiety [21], [22]. As a result, it is essential to consider athletes' emotional states and provide proper and adequate psychological support. According to the available literature, there is also limited research comparing competitive anxiety among athletes at the sports school level [23]. In addition, the researcher is left with questions on how the current COVID-19 pandemic affects athletes' anxiety status toward their sports performance and how the coach takes action for the sake of their athlete performance. To remedy this gap in the research, this research explores the anxiety status of junior archers in COVID-19 during the training isolation period towards the shooting performance.

2.   RESEARCH METHOD
The research works involving human subjects were reviewed and approved by the Universiti Pendidikan Sultan Idris, Malaysia, in the Research Management and Innovation Center (RMIC) Ethics Committee of the Human Research Ethics division. The participants were provided with their written parental consent (Ethic Reference No: 2021-0246-01).

Junior archers from all levels of experience completed an experimental research design and web-based cross-sectional study during phase two of the total lockdown in Malaysia. A quantitative approach was carried out in this study. The online descriptive survey consists of the archer's background and the revised competitive scale anxiety inventory-2 (CSAI-2R) instrument. Heart rate readings were tested on the archers before and after the shooting session. The shooting score performance will be reported along with the heart rate in the online survey.

2.1. Participants
The data were collected through the probability sampling technique sample among participants and was taken by purposive sampling. We recruited participants from Sports School Malaysia Pahang (SSMP), located in Pahang, Malaysia. The city is in the country's East, and this school emphasizes athletes who have excelled in the sport wherein they participate. During recruitment, 41 archers were involved in different levels of achievement in the archery competition, ranging from lower to top archers who volunteered to participate in this study. Inclusion criteria were at least 13 years until PRA-University archery athletes enrolled at the SSMP. However, due to study commitments and self-quarantine after being infected with COVID-19 infection, nine participants dropped out. After removing responses that did not meet the inclusion criteria, the remaining sample consisted of 32 archers who completed the study with a 78% response rate. Regarding study-related characteristics, athletes from the archery sport and different levels of expertise in competition and highest shooting records were included. The participant was classified into categorify: top and lower category junior archer. Only archery in recurve category was eligible to participate. Participation was voluntary, anonymity was guaranteed, and informed consent was obtained to participate in the study. There were no monetary incentives for taking part in the study.

2.2. Procedure

Figure 1 describes the flow of the study procedure during the data collection. Firstly, the data were collected individually with the coach's guidance through an online platform: google meet. This platform has a face-to-face coaching session during athlete's training (synchronize). Before the familiarisation session, participants received a briefing, were aware of their ethical rights, and gave informed consent. Participants gave their demographic data (e.g., age, gender, weight, and height), athlete status (e.g., experience, the highest level of competition, total training (hour/week) and personal score). Participants then completed the CSAI-2R questionnaire and recorded their heart rate (HR) before and after every shooting session. There are two parts of the instrument used in this study; the first part included demographic information about the archers, including age, gender, weight, height, the experienced, highest level of competition and best personal record. The next part of the instrument consisted of three subcomponents to indicate the anxiety level, and the author used the CSAI-2R.
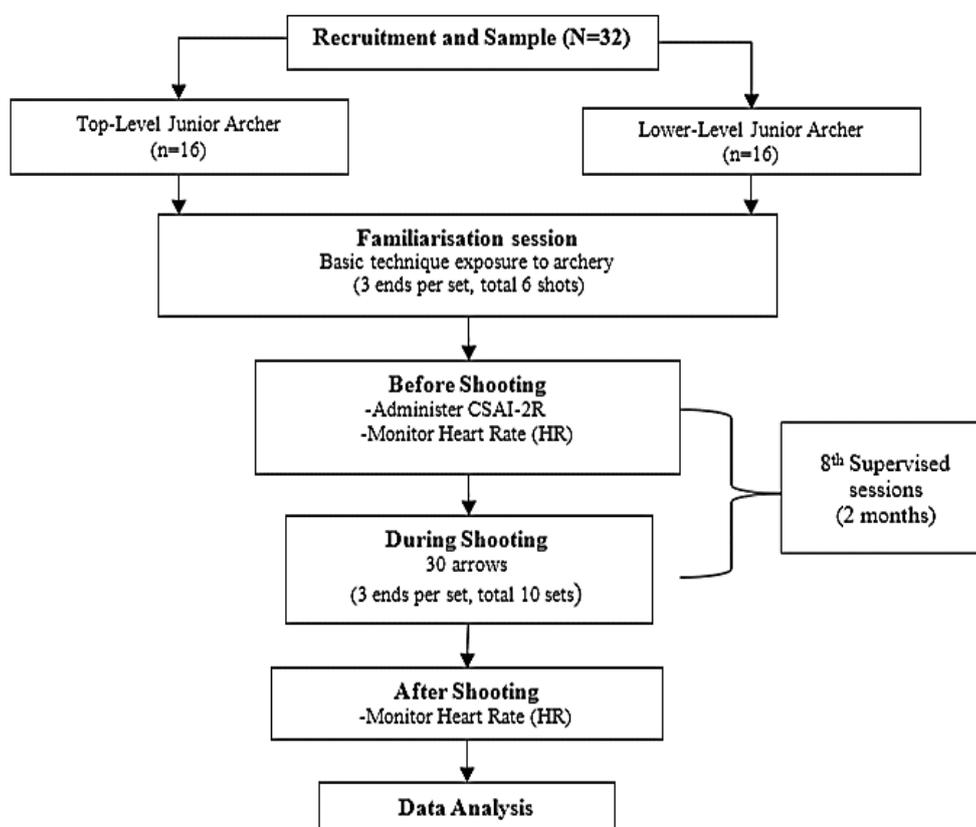

Figure 1. Flowchart of the study procedure

2.2.1. Revised competitive state anxiety inventory 2 (CSAI-2R)

The CSAI-2R focus on a 17-item Likert questionnaire that is used to measure perceived intensities of somatic state anxiety (SSA), cognitive state anxiety (CSA), and self-confidence (SC) promptly before a competition. Each participant must complete the CSAI-2R questionnaire 10 minutes before the shooting session. The SSA scale concerns physiological symptoms of arousal (items 1, 4, 6, 9, 12, 15, and 17). It is composed of items such as the "My body feels tight" question number (Q. 17). In contrast, the SCA scale (items 2, 5, 8, 11, and 14) addresses cognitive symptoms of arousal, such as "I am concerned about performing poorly" in question number (Q. 11). The SC scale (items 3, 7, 10, 13, and 16) rate the perceived ability of the athlete to meet situational demand and includes statements such as "I am confident about performing well" in question number (Q. 10).

CSAI-2R item is assessed on a 4-Likert scale. The questions consisted of three sub-components of anxiety ranging from 1 "not at all" to 4 "very much so". The total scores for the subscale are determined by averaging the items in each subscale. Then, divide by the number of three sub-components and multiply by ten. Higher scores indicated higher intensities of somatic state anxiety, cognitive state anxiety, and self-

confidence. Finding from this study showed excellent internal consistency with Cronbach's alpha coefficients for each sub-component of CSAI-2R (SSA=0.964, CSA=0.962, and SC=0.887). Table 1 shows that Cronbach's alpha coefficients for all anxiety sub-components were above the minimum of 0.7.

Table 1. Reliability test for three sub-components of anxiety

Anxiety sub-component	Items	Cronbach's alpha
Somatic	7	0.964
Cognitive	5	0.962
Self-confidence	5	0.887

2.2.2. Heart rate monitor

Using an ordinary heart rate device can avoid the possibility of provoking and hindering participants' psychological states by fitting them with unfamiliar scientific device sensors. The heart monitor included in this research was a digital pulse oximeter which gives a heart rate reading and allows for simple heart rate measurement with greater comfort to the subjects. Participants measured their heart rate by inserting their right index finger into the digital smart pulse oximeter. Before and after the shooting session, measurements were taken and recorded into the provided google form.

2.2.3. Archery shooting performance

The study only involved archers from the recurve category to obtain the targeted data. Participants were asked to shoot 30 arrows per set based on a modified scoring system. A total of eight sets were shot for two months (eight sessions). Due to the lockdown, the target board was placed 10 meters from the shooting position due to a limited area and space around the archer's house. The recurve bows were used for this study. An experienced coach reminds the basic steps and standard techniques through online google meet (GM) platforms. Six shots (two ends were given three arrows with each end) were allocated to each participant during the familiarisation session before starting the actual shooting session.

2.2.4. Data analysis

The analysis for this study was analyzed using the statistical package for social science (SPSS) version 24.0. All the obtained data were examined for normality through the Shapiro-wilk test except for the variables analyzed through the repeated measure analysis of variance (ANOVA). The correlation study between variables was analyzed by using the pearson correlation coefficient. CSAI-2R questionnaires were scored individually and evaluated using a scoring system to determine the anxiety status among the junior archers. CSAI-2R score, heart rate and total score for both top and lower categories were analyzed using a repeated measure ANOVA. Besides that, the results for the arousal state were based on the difference in gained heart rate between before and after shooting sessions. Statistical significance was accepted at ($p<0.05$).

3. RESULTS AND DISCUSSION

The reporting of the study's research findings begins with the respondents' demographic and characteristics data, subsequently by the levels of respondent anxiety towards the scoring performance. The study applied correlation analyses to measure the relationship for each variable. The variable consisted of somatic anxiety, cognitive anxiety, and self-confidence of junior archers during home training isolation.

3.1. Demographic and characteristic

Table 2 shows the participants' demographic and characteristics data tabulated using frequency distribution. Three-quarters of the participants were male (65.5%). Likely, male participants always dominate in sports, especially in archery. The participants were classified into the top and lower categories based on the highest personal score during the competition. Most participants were 16-17 years old, and the average age for both categories was (16.6 years) for the top and (16.3 years) for the low category. Therefore, all the participants were junior athletes. Meanwhile, there is no apparent difference in height and weight for both categories, (164.5 cm) to (166.3 cm) and (65 kg) to (63.8 kg), with experience of six years and five years.

However, accumulative training time indicates a difference of 16.2 hours and 13.6 hours per week for the top and low athlete categories. Top archers spent more hours on their training sessions, and the majority from the top category experienced participated in a higher competition and required optimal training. Finally, the highest personal scoring of top category athletes recorded a higher mean (350.5) than the low category (333.1). In total, 32 healthy participants willingly participated in this study, and the final participants consisted

of 16 participants equally from both categories. Participants who managed to complete data throughout twelve weeks regarding the study variables were included in the analysis.

Table 2. Demographic and characteristics data

Characteristics	Group (n=32)	
	Top-category (m=11, f=5) Mean (SD)/Median	Lower category (m=9, f=7) Mean (SD)/Median
Age (years)	16.6[a]	16.3[a]
Height (cm)	164.5[b] (3.8)	166.3[b] (6.1)
Weight (kg)	65.0[b] (13.1)	63.8[b] (10.4)
Experience (years)	6.0[a]	5.0[a]
Training time (Hours/week)	16.2[b] (4.9)	13.6[b] (4.1)
Highest score	350.5[b] (31.9)	333.1[b] (11.7)

*m=male, f=female, [a]Median, and [b]Mean

3.2. Anxiety status toward shooting performance

This section describes how athletes felt about their anxiety status during self-shooting training sessions throughout the COVID-19 pandemic outbreak. Figure 2 shows the total result for the mean SD of all three anxiety subscales in CSAI-2R that consists of SSA, CSA, and SC throughout the whole eight sessions in two months of data collection. Top archers indicate higher self-confidence mean with 2.32 (moderately high) than low archers with 1.38. While in contrast, the low archer recorded high anxiety for both cognitive and somatic anxiety compared to the top archer. The top archer category has the ability to control their anxiety and have solid mental endurance with broad experience through this archery sport.
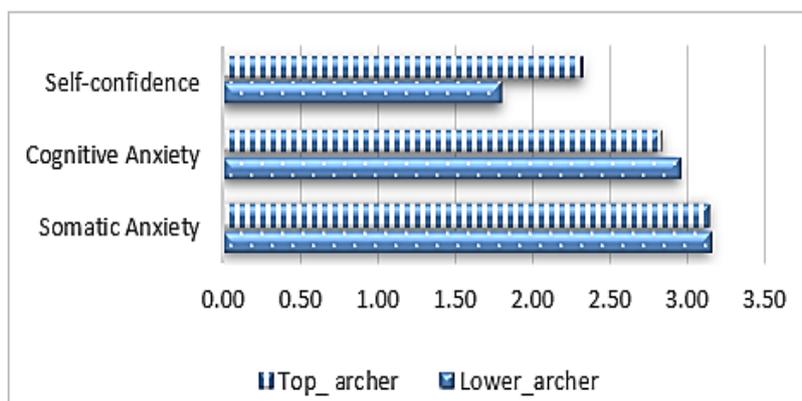

Figure 2. The mean of the sub-components of CSAI-2R for junior archers' top and lower categories

The anxiety performance during training shooting depends on how the athlete perceives their somatic and cognitive anxiety. The anxiety might be facilitative or debilitative and depends on the individual ability to control it. When debilitative anxiety dominates the archers, they lose concentration, resulting in inconsistent shooting score performance. Table 3 compares the archer's feelings between the research's first and final weeks. There is a declination of anxiety status for all anxiety statement items for somatic and cognitive state anxiety. Most of the archers feel anxiety during the first week of the observation, and their anxiety levels decrease from week to week. The finding is in line with Mortejo [24], who discovered that athlete anxiety performance could be well controlled when the athlete adequately gains constant monitoring from the coach [25]–[27]. Therefore, athletes require face-to-face monitoring from the coach despite being in different places while movement control is carried out, as already discussed in a previous study [28].

Table 4 indicates the detailed mean and standard deviation scores for top and lower category shooting performance. The shooting score performance for the second session in the second month indicates the increment for both top and lower-level categories. The results indicate an improvement in weekly performance by the athlete's shooting performance after this study was done with full online supervision from the coach. The anxiety of athlete status showed a declining trend when the coach made regular monitoring and recorded the total scoring from the beginning to the end of the study session was implemented. It can be concluded that athletes need guidance from the coach despite making training sessions separately due to MCO. With adequate

monitoring, athletes have high confidence during the training session [29]. This finding is consistent with the previous study among endurance athletes, where performance was affected due to training restrictions during the pandemic [30].

Table 3. The comparison between archer's feeling on somatic and cognitive state anxiety statement during week 1 and week 8 during MCO

Statement	Level of agreement	Week 1 (%)	Week 8 (%)
I feel jittery (Q1)	Not at all	0	8
	Somewhat	10	10
	Moderately so	15	10
	Very much so	7	4
	Total	32	
My body feels tense (Q4)	Not at all	18	21
	Somewhat	11	10
	Moderately so	1	1
	Very much so	2	0
	Total	32	
I feel tense in my stomach (Q6)	Not at all	18	22
	Somewhat	9	5
	Moderately so	3	3
	Very much so	2	1
	Total	32	
My heart is racing (9)	Not at all	0	14
	Somewhat	19	13
	Moderately so	10	4
	Very much so	3	1
	Total	32	
I feel my stomach sinking (Q12)	Not at all	17	22
	Somewhat	11	8
	Moderately so	2	2
	Very much so	2	0
	Total	32	
My hands are clammy (Q15)	Not at all	15	3
	Somewhat	11	23
	Moderately so	3	6
	Very much so	3	0
	Total	32	
My body feels tight (Q17)	Not at all	11	22
	Somewhat	11	7
	Moderately so	5	1
	Very much so	5	2
	Total	32	

Table 4. Shooting score performance by session for top and lower category

Session	Category	Archery shooting performance score, mean (SD)	SSA	CSA	SC
Month 1	Top-level	236.7 (46.1)	2.9	2.6	2.8
	Lower level	172.8 (48.5)	3.1	2.9	2.3
Month 2	Top-level	248.4 (47.8)	2.6	1.6	3.2
	Lower level	175.2 (40.2)	3.0	2.2	3.0
Total	Top-level	238.4 (44.9)	2.75	2.1	3
	Lower level	174.0 (44.3)	3.1	2.5	2.7

Table 5 shows the mean heart rate of both archers' categories achieved before and after shooting sessions. During the data analysis, before and after heart rates level were collected. The mean (SD) for before and after shooting session heart rates were 91.5 (22.8) and 104.6 (20.2) beats per minute for top junior archers, whereas in the lower category of archers were 75.1 (11.3) and 95.2 (16.4). The result indicated that top-level archers face a higher heart rate than lower-level archers. Top-level archers are determined to get high scoring during the shooting session.

Table 5. Mean (SD) of participant's arousal state before and after shooting

	Heart rate (beats/min)	
	Top junior archer	Lower junior archer
Before shooting performance	91.5 (22.8)	75.1 (11.3)
After shooting performance	104 6 (20.2)	95.2 (16.4)

3.3. Correlation analysis

The correlation analysis was performed to measure the relationship between three subcomponents of anxiety (SSA, CSA, and SC) and the score of junior archers during their training isolation period, as tabulated in Table 6. In general, the strength of the relationship among those variables varied from very weak to a moderate range. Based on the result of the correlation analysis, SSA and CSA (r=0.67; p=0.00) had a moderate relationship, accompanied by SC and CSA (r=0.55; p=0.72). Meanwhile the relationship between SC and score (r=0.36; p=0.02), followed by CSA and score (r=0.31; p=0.554) and SSA and score (r=0.24; p=0.487) was found to have a very weak relationship.

Table 6. Correlation analysis between somatic, cognitive, self-confidence, and score

Variables	Score	SSA	CSA	SC
Score	1			
SSA	0.24	1		
	0.49			
CSA	0.31	0.67	1	
	0.55	0.000		
SC	0.36*	0.21	0.55	1
	0.02	0.28	0.72	
Total, N	32	32	32	32

*Correlation is significant at the 0.05 level (2-tailed)

Figure 3 summarises the correlation analysis result using a simple correlate model. The relationship among those variables described that the junior archers' somatic and cognitive anxiety affected their training isolation during COVID-19. Moreover, Self-confidence was found to connect with the junior archers' shooting score performance to overcome debilitative anxiety during training isolation. Meanwhile, both anxiety levels were the main reason the archers experienced inconsistent shooting performance. The result responds to the weak relationship between SSA and score, followed by CSA and score. The reason is that the pandemic was perceived to be threatening, and when someone has unstable anxiety, they propensity to have inconsistent shooting performance and poor scores.
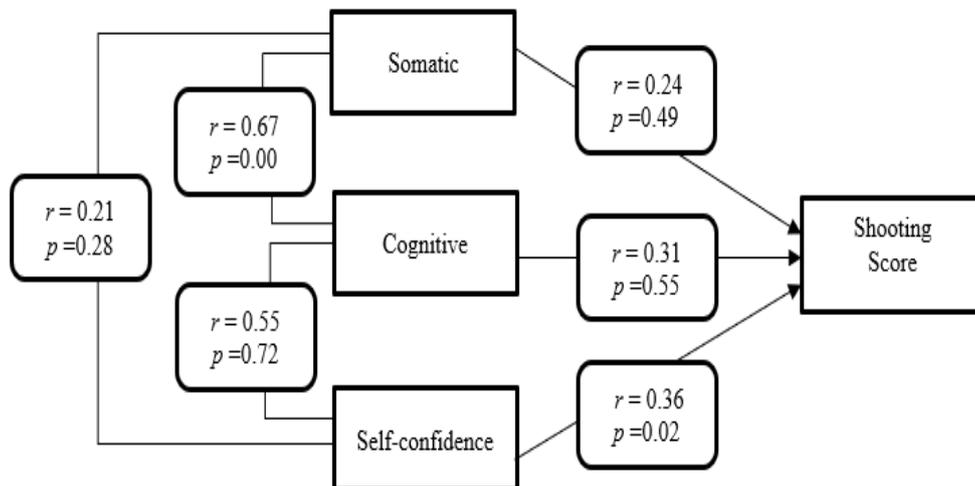

Figure 3. Summary of correlation analysis between anxiety subcomponent and score

4. LIMITATION

Throughout the research study, the author faces some limitations that can be covered for future studies. First, during the lockdown, athletes must adapt to various external factors, especially with limited space to shoot the arrow and lack of proper facilities, archery target butt and others. However, this is overcome by restructures and arranging the specific distance for the shooting activity. Second, this research faces a limited physiological parameter to measure the anxiety level since all the respondents were in their respective homes with limited access and called it a device. As COVID-19 will be shifted to endemic mode, future research in this area is suggested to extend a longitudinal approach and gain more anxiety parameters such as in elevated

blood pressure, increasing heart rate, and inconsistence skin reaction to define the anxiety status. In addition, it would be beneficial to have an additional instrument to get the exact anxiety status among the athletes. By comparing with a few anxiety instruments, the result of the study could be more accurate, and highly valuable for the coach's reference source.

5.   CONCLUSION

Anxiety among athletes could have a detrimental effect on psychological and physiological performance. Because of the COVID-19 pandemic and social isolation practices, athletes experienced anxiety, which may substantially increase the pandemic's duration and social isolation. In this study, the authors found that junior archers experienced anxiety and self-confidence due to changes in archers shooting performance during pandemics and MCO. Due to limited physical training and spending more time sitting and screen time at home, the athletes show declination of stamina and focus on their shooting performance. So, during this pandemic phase, the athlete's lifestyle changed abruptly, and they needed to allocate a great deal of time to recover their performance. The athlete's mental health is also affected by all these alterations in regular training activities. Decreasing physical activities, the rate of anxiety increased significantly. Those who maintain their normal training lifestyle without being affected by home isolation do not show much change in anxiety level and maintain their shooting performance well. Anxiety can positively or negatively impact a player's performance, and it is about how the athlete perceives the anxiety, either facilitative or debilitative anxiety. The study finding also affirmed that the shooting training isolation influences the level of anxiety and resulting inconsistent score performance during the current pandemic breakout. It is worth noting that the present study was carried out at the end of the MCO period's third phase before three months into the endemic phase of COVID-19. At the end of the survey, the Malaysian government gradually announced the reopening of a few main sectors, including the activity for the sports sector. However, the execution of activities is carried out in a new normal.

Besides that, these findings confirmed that those who exercise alone experience more anxiety and lack self-confidence. Due to an improvement in rumbling rate and athlete confidence from the first to the final session of the study and athlete achievement. This indicates better athletes' mental and physical health development when face-to-face monitoring sessions are implemented, even if only using the online platform. Nevertheless, this is enough to help the athletes maintain their performance despite being in this pandemic. Furthermore, correlation analysis revealed a significant link between somatic, cognitive, self-confidence, and score. The most substantial relationship was found between self-confidence and scores, somatic status and cognitive state anxiety. This emphasizes the importance of controlling mental health among athletes in maintaining athletic performance despite being unable to participate in physical training sessions with the coach during MCO. In order to combat the COVID-19 epidemic, athletes and coaches must implement various positive measures and practices to ensure that athletes' performance remains in good condition. Therefore, this study suggests that athletes who experience sports anxiety should get further consultation with a clinical sports psychologist or qualified clinicians depending on the available expertise in that community resources. With this knowledge, the coach can make a new appropriate structure of the athlete's game plans and training strategies. Considering the outcomes of the research findings, psychological support practices to reduce anxiety about health and getting coronavirus in this pandemic and social isolation may contribute to a shorter duration of athletes' return to competitions and races after the pandemic.

REFERENCES

[1]   J. Goergen, A. Bavishi, M. Eimer, and A. R. Zielinski, "COVID-19: the risk to athletes," *Current Treatment Options in Cardiovascular Medicine*, vol. 23, no. 11, p. 68, Nov. 2021, doi: 10.1007/s11936-021-00941-2.

[2]   J. Kurniarobbi, C. Chikih, M. Andeansah, R. Lestari, and I. Sukendar, "Athletes sleep duration during COVID-19 pandemic and its relationship with health condition," *International Journal of Public Health Science*, vol. 11, no. 1, pp. 61–68, Mar. 2022, doi: 10.11591/ijphs.v11i1.21089.

[3]   H. A. Shepherd *et al.*, "The impact of COVID-19 on high school student-athlete experiences with physical activity, mental health, and social connection," *International Journal of Environmental Research and Public Health*, vol. 18, no. 7, p. 3515, Mar. 2021, doi: 10.3390/ijerph18073515.

[4]   J. Smith *et al.*, "Academic impact of COVID-19 in collegiate athletes," *Kansas Journal of Medicine*, vol. 15, no. 1, pp. 101–105,

Mar. 2022, doi: 10.17161/kjm.vol15.16327.

[5] C. C. Uroh and C. M. Adewunmi, "Psychological impact of the COVID-19 pandemic on athletes," *Frontiers in Sports and Active Living*, vol. 3, Apr. 2021, doi: 10.3389/fspor.2021.603415.

[6] J. A. Washif *et al.*, "Training during the COVID-19 lockdown: knowledge, beliefs, and practices of 12,526 athletes from 142 countries and six continents," *Sports Medicine*, vol. 52, no. 4, pp. 933–948, Apr. 2022, doi: 10.1007/s40279-021-01573-z.

[7] E. R. Facer-Childs, D. Hoffman, J. N. Tran, S. P. A. Drummond, and S. M. W. Rajaratnam, "Sleep and mental health in athletes during COVID-19 lockdown," *Sleep*, vol. 44, no. 5, May 2021, doi: 10.1093/sleep/zsaa261.

[8] M. You, H. Liu, and Z. Wu, "The spread of COVID-19 in athletes," *Science and Sports*, vol. 37, no. 2, pp. 123–130, Apr. 2022, doi: 10.1016/j.scispo.2021.03.012.

[9] S. Debnath and S. Debnath, "Performance evaluation by image processing techniques in Archery-a case study," *International Journal of New Technologies in Science and Engineering*, vol. 3, no. 1, pp. 1–6, 2016.

[10] M. S. Ariffin, "Upper extremity muscle force for traditional archery using khatrah technique," *International Journal of Advanced Trends in Computer Science and Engineering*, vol. 9, no. 1.4, pp. 632–637, Sep. 2020, doi: 10.30534/ijatcse/2020/8891.42020.

[11] W. P. Loh and Y. Y. Chong, "Classifying the archery performance with conditional effects on angular and linear shooting techniques," *Journal of Telecommunication, Electronic and Computer Engineering*, vol. 10, no. 3–2, pp. 95–99, 2018.

[12] A. J. Callaway, J. Wiedlack, and M. Heller, "Identification of temporal factors related to shot performance for indoor recurve archery," *Journal of Sports Sciences*, vol. 35, no. 12, pp. 1142–1147, Jun. 2017, doi: 10.1080/02640414.2016.1211730.

[13] G. Kuan and Y.-C. Kueh, "Psychological skills during training and competition on recovery-Stress state among adolescent state athletes," *Journal of Sports Research*, vol. 2, no. 4, pp. 122–130, 2015, doi: 10.18488/journal.90/2015.2.4/90.4.122.130.

[14] S. Zhang, T. Woodman, and R. Roberts, "Anxiety and fear in sport and performance," in *Oxford Research Encyclopedia of Psychology*, Oxford University Press, 2018.

[15] M. Correia and A. Rosado, "Anxiety in athletes: gender and type of sport differences," *International Journal of Psychological Research*, vol. 12, no. 1, pp. 9–17, May 2019, doi: 10.21500/20112084.3552.

[16] G. Ozen, H. Koc, and C. Aksoy, "Health anxiety status of elite athletes in COVID-19 social isolation period," *Bratislava Medical Journal*, vol. 121, no. 12, pp. 888–893, 2020, doi: 10.4149/BLL_2020_146.

[17] H. Prapavessis, H. Cox, and L. Brooks, "A test of Martens, Vealey and Burton's theory of competitive anxiety," *Australian Journal of Science and Medicine in Sport*, vol. 28, no. 1, pp. 24–29, 1996.

[18] J. Fry, "Sport and the anxious mind," *Journal of the Philosophy of Sport*, vol. 46, no. 2, pp. 177–190, May 2019, doi: 10.1080/00948705.2019.1610966.

[19] and F. G. M. Daneshpayeh, F. Dortaj, F. Hasanvand, "Construct and Validation of the Coronavirus Epidemic Multidimensional Anxiety questionnaire," *Journal of Measuring and Educational Evaluation Studies*, vol. 11, no. 34, pp. 121–135, 2020.

[20] W. N. Wan Ahmad, Z. Ghazalli, and M. A. H. Mohd Adib, "Anxiety performance among athlete in response to theories and standard instruments: a systematic review," in *Lecture Notes in Mechanical Engineering*, 2022, pp. 379–394.

[21] M. M. Fernández, F. Dal Bello, L. B. M. Barreto, C. J. Brito, B. Miarka, and A. L. Díaz-De-Durana, "State-trait anxiety and reduced emotional intelligence in combat sport athletes of different genders and competitive levels," *Journal of Physical Education and Sport*, vol. 19, pp. 363–368, 2019, doi: 10.7752/jpes.2019.s2054.

[22] J. Pons, C. Viladrich, Y. Ramis, and R. Polman, "The mediating role of coping between competitive anxiety and sport commitment in adolescent athletes," *Spanish Journal of Psychology*, vol. 21, p. E7, Mar. 2018, doi: 10.1017/sjp.2018.8.

[23] C. Koob, K. Schröpfer, M. Coenen, S. Kus, and N. Schmidt, "Factors influencing study engagement during the COVID-19 pandemic: a cross-sectional study among health and social professions students," *PLoS ONE*, vol. 16, no. 7 July, p. e0255191, Jul. 2021, doi: 10.1371/journal.pone.0255191.

[24] J. Baker, J. Côté, and R. Hawes, "The relationship between coaching behaviours and sport anxiety in athletes," *Journal of Science and Medicine in Sport*, vol. 3, no. 2, pp. 110–119, Jun. 2000, doi: 10.1016/S1440-2440(00)80073-0.

[25] A. R. Nicholls and J. L. Perry, "Perceptions of coach-athlete relationship are more important to coaches than athletes in predicting dyadic coping and stress appraisals: An actor-partner independence mediation model," *Frontiers in Psychology*, vol. 7, no. MAR, Mar. 2016, doi: 10.3389/fpsyg.2016.00447.

[26] K.-Y. Choi, "The relationship between coaches-athletes relations and team atmosphere, depending on interactions between coaches and athletes," *Korean Journal of Sports Science*, vol. 29, no. 6, pp. 625–637, Dec. 2020, doi: 10.35159/kjss.2020.12.29.6.625.

[27] S. J. Foulds, S. M. Hoffmann, K. Hinck, and F. Carson, "The coach–athlete relationship in strength and conditioning: High performance athletes' perceptions," *Sports*, vol. 7, no. 12, p. 244, Dec. 2019, doi: 10.3390/sports7120244.

[28] C. Lambert *et al.*, "Depressive symptoms among Olympic athletes during the COVID-19 pandemic," *BMC Sports Science, Medicine and Rehabilitation*, vol. 14, no. 1, p. 36, Dec. 2022, doi: 10.1186/s13102-022-00427-z.

[29] Y. Karaca 1a and B. Filiz, "Applications towards sports during COVID-19 pandemic," *Turkish Journal of Sport and Exercise*, vol. 23, no. 2, pp. 259–265, 2021.

[30] B. Harman, G. Dessart, L. Puke, and R. A. Philippe, "Coping and resilience among endurance athletes during the COVID-19 pandemic," *Frontiers in Psychology*, vol. 13, May 2022, doi: 10.3389/fpsyg.2022.811499.

BIOGRAPHIES OF AUTHORS

Wan Nurlisa Wan Ahmad ⓘ 👥 SC ◆ is a lecturer of Engineering Technology, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris, Malaysia. She is currently pursuing PhD in Universiti Malaysia Pahang, Malaysia under Medical Engineering and Health Intervention Team (MedHiT). Her research interests include Biomechanical Engineering, Health Monitoring System for Wireless Sensor Networks, Internet of Things, and Technical and Vocational Education and Training (TVET). She is interested in exploring human determinants of health and wellbeing in later life. She can be contacted at email: nurlisa@ftv.upsi.edu.my.

Mohd Azrul Hisham Mohd Adib 🆔 8ᵍ SC ⭕ is a senior lecturer in Universiti Malaysia Pahang. He is currently attached to the Department of Mechanical Engineering, College of Engineering. He also the head of Medical Engineering and Health Intervention Team (MedHiT) in Universiti Malaysia Pahang. His research interest includes Sport Biomechanics, Biomedical Engineering, Cardiovascular and Neurovascular Imaging, Medical Device, and Bio-Modelling and Simulation. Presently he involves research in Rehab Gamification and Game for Health. He can be contacted at email: azrul@ump.edu.my.

Irdayanti Binti Mat Nashir 🆔 8ᵍ SC ⭕ is a senior lecturer at the Department of Engineering Technology, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris. She holds a bachelor's degree in Electrical Engineering, Master's Degree and Doctorate in Technical and Vocational. She is currently attached as a coordinator in Research Management and Innovation Center in Universiti Pendidikan Sultan Idris. Her research interest includes TVET Education, Engineering Education and Statistics. She can be contacted at email: irdayanti@ftv.upsi.edu.my.

Mon Redee Sut Txi 🆔 8ᵍ SC ⭕ is a senior lecturer of Sport Science, Faculty of sports sciences and coaching, Universiti Pendidikan Sultan Idris, Malaysia. She is the author of the book on Basic Archery Technique. She is actively involved in archery. Her research interests include Sports Psychology, Sports Coaching and Sports Performance. She can be contacted at email: monredee@fsskj.upsi.edu.my.

Fatin Nurfatehah Mat Salleh 🆔 8ᵍ SC ⭕ is a PhD candidate at Faculty of Sports Science and Coaching in Universiti Pendidikan Sultan Idris, Malaysia. She is a national athlete actively involved in archery. Her research interest includes Biomechanics, Sports Psychology and Sports Performance. She can be contacted at email: fatin_xxx@yahoo.com.au.

Jing Rui Tang 🆔 8ᵍ SC ⭕ is a senior lecturer at the Department of Engineering Technology, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris. She holds the B.Eng. degree (Hons.) in Mechatronic Engineering and the Ph.D. degree in Computational Intelligence from Universiti Sains Malaysia, Malaysia, in 2012 and 2017, respectively. Her area of expertise in Digital Image Processing and her research interest includes TVET Education, Engineering Education, and Intelligent Diagnostic System. She can be contacted at email: tangjingrui@ftv.upsi.edu.my.