Diploma in Sport and Exercise Sciences
Physiology of Sport and Exercise
Summative 1 Assignment
September 2018

8 WEEK PERIODISATION PLAN FOR FLAMING ARROWS ARCHERY CLUB IN PREPARATION FOR NUS ARCHERY INDOOR CHAMPIONSHIP 2019

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1. Introduction

1.1 Periodisation Plan Objective

The purpose of this 8 weeks periodisation plan is to provide physiological preparation of the club members of the Flaming Arrows Archery Club who are participating in the yearly NUS Indoor Archery Championship (https://www.facebook.com/NUSIndoors/), next expected to be in early June 2019.

The plan will take into consideration the background of the archers. Specifically, we will be focusing only on the recurve archers. Archers shooting in the compound bow categories are not the priority, although they can also make use of the periodisation plan. This is because the compound bow relies heavily on mechanisms and tools (e.g. pulley systems, magnifying lens, bubble level) and can achieve better results with less physical demands.

Common issues with archers in the recurve bow category will be discussed, illustrated with data from the competition results obtained from 2014, 2015, 2017 and 2018 (Appendix A).

The periodisation plan will not cover all the possible physiological requirements of an archer at the professional level, but aims to make key improvements to the archers to avoid common problems and achieve better results, within 8 weeks leading up to the competition.

Figure 1 - FAAC members at the NUS Indoor Archery Championship 2018. © FAAC.

2. Participants and the Sport

2.1 The Participants

The participants of this 8-week periodisation plan are members of the archery club who intends to take part in the NUS Indoor Archery Championship 2019, usually scheduled in early June during the school holidays.

Some of these archers are experienced archers who are in their school teams and took part in inter-school and national competitions. Others are leisure archers of the clubs and have no competitive archery experience. Age-wise, they range from secondary students to middle-age working adults.

Currently, these archery club members only practice once or twice a week, at the club's indoor archery range located at Woodlands on Saturdays and Sundays. They only focus on archery skills and techniques, and does not focus on other physiological aspects common to other sports, like cardiovascular or strength training.

With data from the competition results from 2014, 2015, 2017 and 2018, we want to identify common issues with leisure and beginner archers, and purposefully train the archers so they can achieve better results at the competition. As these archers train their technical skills at the archery range on weekends, our periodisation plan will focus on additional weekday programs that the archers will train on their own.

2.2. The Sport and its Demands

There are 2 common types of competitive archery - recurve archery (also known as Olympic archery), and compound archery. For our periodisation plan, we will focus on recurve archery. Other than the fact that recurve archery requires more fundamental skills and less technology as assistance, most beginner archers begin archery from the recurve bow, and our periodisation plan will be more useful to them.

In general, archery is a static sport requiring general and specific strength and endurance of whole and upper body. Shooting an arrow includes some specific movement patterns. These patterns occur in the same sequence all the time in spit of fatigue. Although archery does not appear to be very fitness demanding, when closely examined, both training and competition do demand a certain extent of long hours of concentration with some ability of strength, endurance and postural fine control.

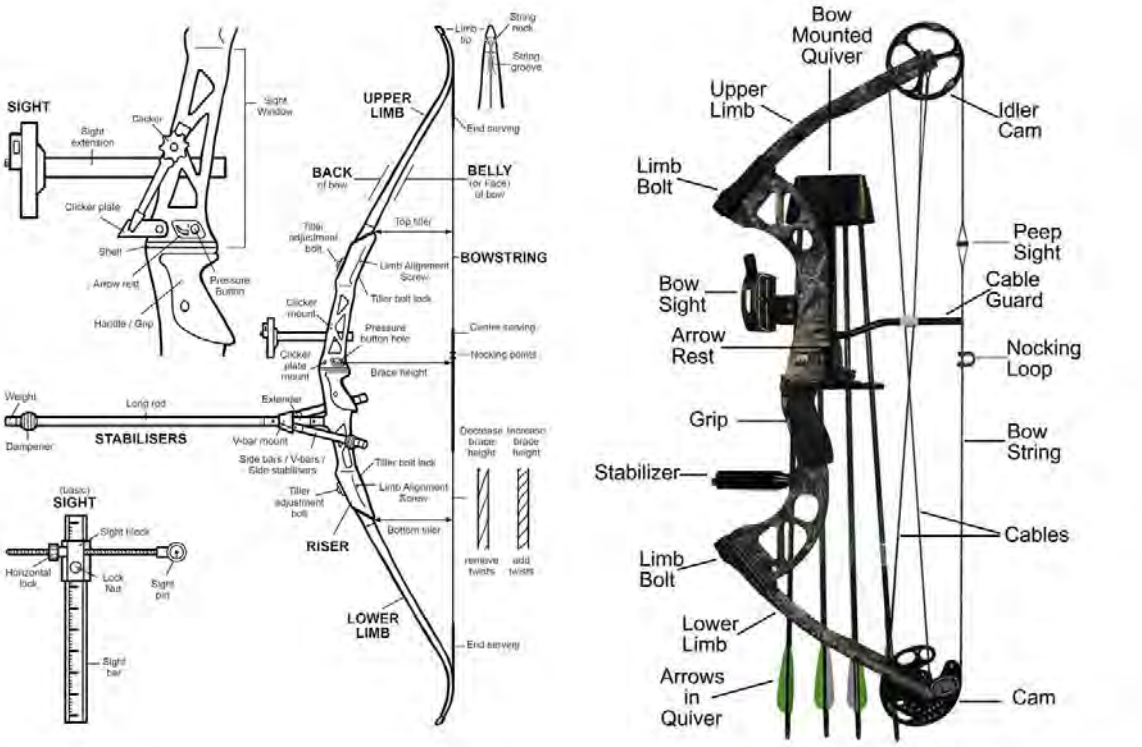


Figure 2 - Parts of recurve bow (left, © Jessica Emmett) vs compound bow (right, © Kerrs Archery Pros).

Please note that in archery, when we refer to the “weight” of a bow, we usually to the resistance that an archer exerts pulling the bowstring and pushing the bow riser (body). This “weight” will be transferred to the arrow as the propelling force when the archer releases the string. The actual mass of the entire bow setup is usually between 3-5kg and will not be discussed in this report.

To be able to apply pulling force to the string and pushing force to the bow, in a specific postural form, this comes with a sound technique. Hence, it is important to have the long lasting training or competition performed without any sign of fatigue or loss of quality in archer’s shots.

With effective training on cardiac function, a lower heart rate (HR) for a given intensity of exercise or work can be achieved. Reduced stress on cardiovascular system as a whole and on HR will increase the stability and aiming steadiness during shooting. This is similar to other shooting sports.

Most archers pay extra attention to the equipments - bow, accessories and arrows, and they try to keep technologically up to date. However, in most cases similar attention is not paid to the fitness level, especially the general and specific endurance components, which are very prerequisites for success.

In the NUS Indoor Archery Championship, the archers shoot indoor, at a target 18m away, on a “40cm” target face. The labeled size of the target face is based on the full 10-ring face, and the 40cm triple-face target does not have rings 1 to 5, thus only 20cm wide, but still considered a 40cm target. Examples of the target faces are illustrated in Figure 3. The novice category archers shoot at the full 40cm single-face target, whereas the intermediate and open categories archers shoot at the 40cm triple-face targets.

They shoot a total of 3 arrows per end x 10 ends x 2 rounds - for a total of 60 arrows being shot in the initial individual ranking round. Each arrow needs to be shot within 40 seconds. The typical “weight” (loading strength) of the recurve bow is between 20-40lb (9-18kg). This means an archer will pull and hold close to 1 metric ton of weight for the 60 shots in total. Each arrow shot can have a maximum of 10 points, so the maximum point that can be achieved is 600. Only the top 16 archers for each category will advance to the Individual Elimination round.

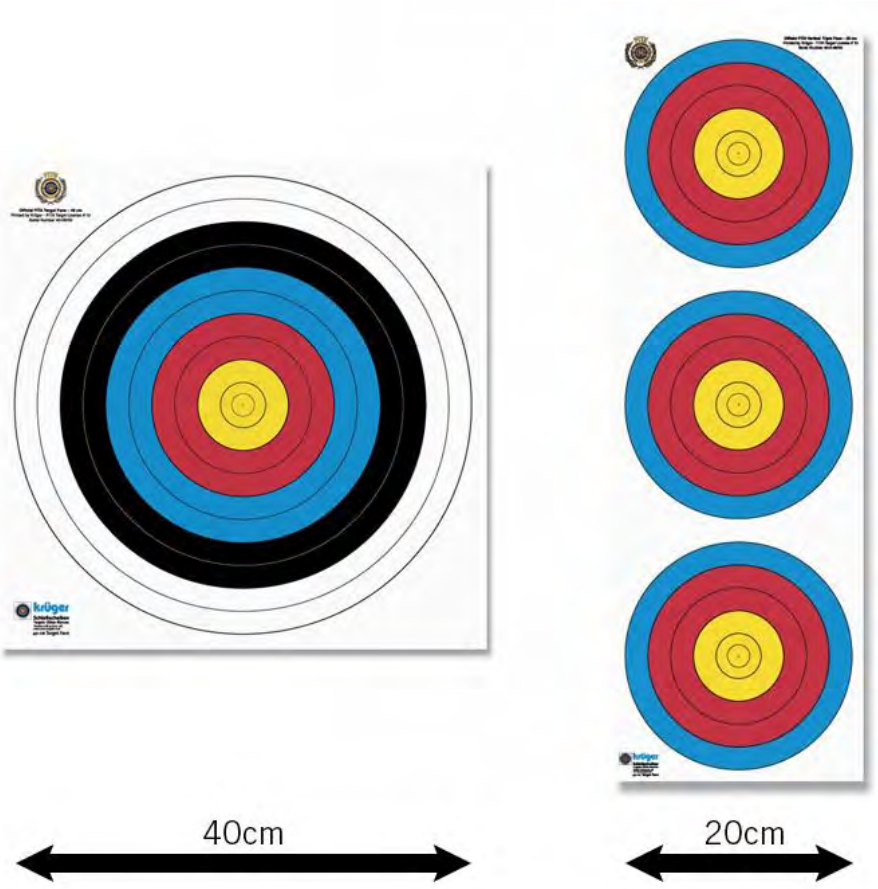


Figure 3 - FITA 40cm Single-Face (left) and 40cm Vertical Triple-Face (right). © FITA.

2.3 Type of Energy System

Archery is considered a sport that taxes the phosphagen and the anaerobic glycolysis system, and less on the aerobic system. It does not have any extreme requirement of any specific system, as sufficient time (40s) is given for each shot. The anaerobic system is the main system that is taxed, due to the strength required in holding the bow at draw. It is also an endurance based sport, where the athlete is involved with repeated actions, which alactic anaerobic.

The lactic build-up causing a drop in performance due to the inability to maintain the required posture is the most common problem.

To check if muscle endurance is a recurring issue, we have obtained the individual scores of the event over 4 years (2014, 2015, 2017, 2018) and plotted the score differences (Appendix A) between the 2 rounds of the individual competition for each participating archer, against their total scores. We assume that archers who obtain a higher combined score are the experienced and skilled archers who are able to overcome muscle endurance issues.

To determine if sex has any contributing factor, we plot the charts separately for the male and female archers.

We observed that the male archers, in particular the less experienced ones, consistently have a wider disparity in the scores between the 2 rounds, and tend to perform worse in the second round (observing the trend lines in the chart). Male archers generally use a heavier bow because they are stronger, although the target distance is the same as the female archers, and the female archers can score as well using lighter bows. The charts for the female archers does not display a consistent worse-off scores in the second round compared to the male archers, and the difference in scores are within a smaller range than the male archers.

Rather than getting the male archers to reduce the strength of their bows (and hurting their egos), we will include strength and endurance training in the periodisation plan. The female archers can definitely also benefit from this periodisation plan.

2.4 Muscle Groups

The main muscle groups used by archers are the upper body and arms. The core muscles are required to maintain the shooting posture, but most archers do not have issues with the core muscle group as the smaller muscles in the upper body (e.g. shoulders) will usually tire out first. Here are diagrams of the key muscle groups.

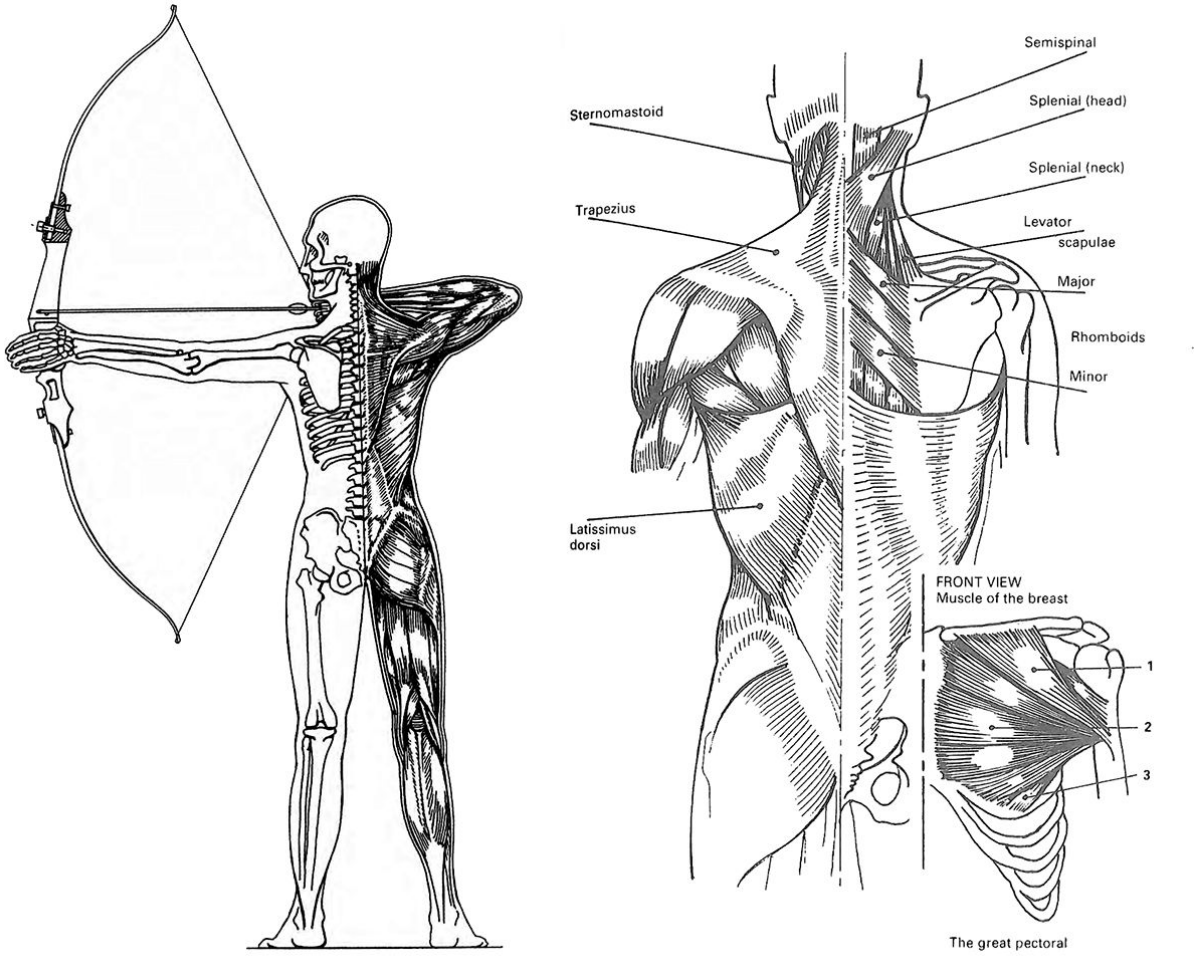


Figure 4 - Archery posture (left) and main engaged muscle groups in the back and front (right). © Axford, Ray. 'Archery Anatomy: An Introduction to Techniques for Improved Performance', Souvenir Press, 1995. pp 77, 35.

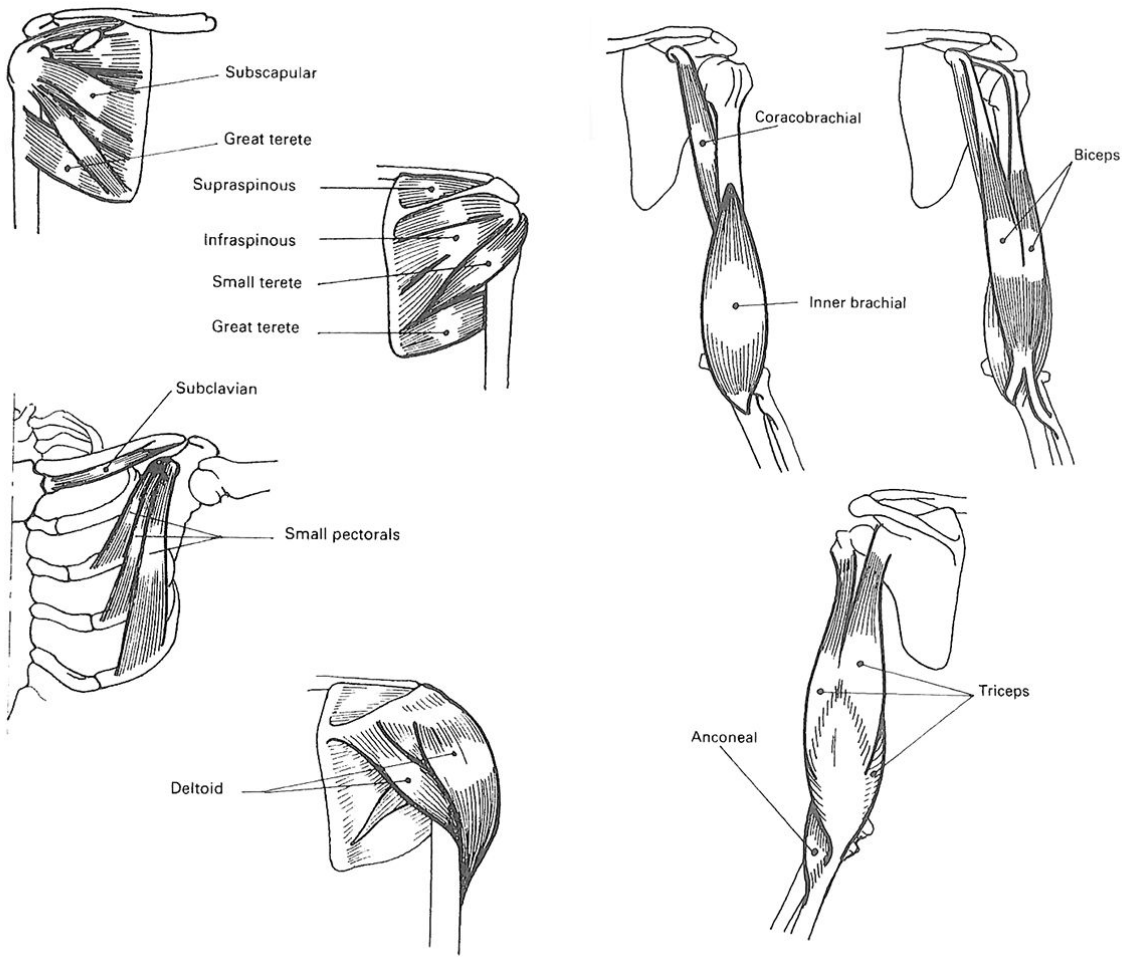


Figure 5 - Specific muscles engaged around the shoulders (left) and the upper arms (right). © Axford, Ray. 'Archery Anatomy: An Introduction to Techniques for Improved Performance', Souvenir Press, 1995. pp 31, 33.

To keep up the desired posture and balance during shooting, most of these muscles are engaged in isometric muscle contraction, i.e. contracting without changing their length. Concentric isotonic contractions also occur with every shot, i.e. length of muscle is shortening while applying force when pulling arrow back. Eccentric isotonic contractions are less common, but occurs when the archer has to ease or release the string-hold without firing the arrow, e.g. when arrow encounters a mounting problem.

In our strength and endurance training for the participant's upper body, we will mostly be working on multi-joint exercises (MJE) to train multiple muscle groups at one go. Smaller muscle groups like the forearms, biceps and triceps may require less isolated training. From experience, archers will tire out their shoulders first, so our single-joint exercises (SJE) will mainly be for the shoulders.

3. Periodisation

3.1 Aim of the Periodisation

In 8 weeks, we want the participating archers to improve the general strength and endurance of their upper body muscles, particularly the back, shoulders and arms. For cardiovascular, the archers should also find themselves having a lower resting heart rate, and the ability to lower their heart rate faster than before. These improvements will allow them to perform more consistently between the 2 rounds of the competition, with less difference in scores between the two rounds, and score higher in total as well.

Outside of the competition, the training adaptations will enable the archers to shoot similar shots more repetitively, have higher capacity for training, and develop less fatigue at the end of the training session. These changes should be observed in training by the archers themselves over the 8 weeks.

3.2 Rationale and Assumptions

We apply the 5 principles of training to the periodisation program.

A. **Specificity** - As discussed in the previous section, We have 3 key training specifics. First, the training in our periodisation will focus on the required muscle group, mainly upper body, consisting of the back, shoulders and arms. However, to avoid muscle imbalance, we will need to consider agonist and antagonist muscles. For example, although the back muscles are important, we will also train the chest muscles to ensure muscle balance. Second, other than the muscles strength, the training program also needs to improve the endurance of the specific muscle groups. Lastly, we want to improve is the cardiovascular fitness to improve resting heart rate.

B. **Progressive Overload** - As most of the archers who will be involved in this periodisation do not have regular physical strength and cardiovascular trainings, we will need to provide a gradual increase in training load to avoid potential injuries.

C. **Individuality** - The training plan should also be suitable to the lifestyle of the archers. These archers are full-time students with archery as a Co-Curricular Activity (CCA), and full-time working adults who have family commitments after work. We do not expect to give them a daily training plan. It should try to achieve our aim with minimum time commitment.

D. **Variation** - We want to ensure that the training plan is sustainable, that the members will not find them boring and subsequently stop training. Moreover, not all members have access to gyms, or similar training equipments. Other than keeping the training options interesting, the variations should also provide alternatives exercises. Working adults with access to gyms may prefer trainings with free weights or equipments from their gym. Freely accessible tools or equipment-free training, such as body weight exercises, may be more suitable for students.

E. **Reversibility** - When the exerciser stops training for too long a time, any adaptation that takes place may be lost. To avoid this, we will ensure the break in between the training is not excessive, although recovery period is definitely required. In the week before the actual competition, we will tailor the training to be for maintenance instead of overloading.

Based on our periodisation duration of 8 weeks, our training plan will consist of weekly microcycles, and we will take the 8 weeks as a long mesocycle. There will be no macrocycle in our periodisation training plan.

We note that strength does not only develop through muscle hypertrophy, but also through inter- and intra-neuromuscular coordination. In fact, strength development due to muscular coordination typically takes place before the hypertrophic development. Hence, as there is also no extreme strength requirement, we will also note that the strength increase in the archers will not actually make them look buffed up.

3.3 Training Periodisation

Figure 6 below is the overview of the 8 weeks training schedule. The club members currently attend self-practice at the archery range for around 2 hours each time, on Saturdays and/or Sundays. Currently the range is not open on weekdays.

For a strength, endurance and cardiovascular training schedule that the archers can manage on their own, we are proposing 3 1-hourly training sessions on Mondays, Wednesdays and Fridays. They can incorporate these after their school or work. To allow the trained muscle groups to rest sufficiently, we are rotating the target muscle groups - Mondays for the back and biceps, Wednesdays for the chest and triceps, and Fridays for shoulders and core. Tuesdays and Thursday are rest days for the archers. If the archers' schedule does not allow, we would allow the archers to reduce the training sessions to twice a week, with rest days in between.

Training Schedule

WEEK	MON	TUE	WED	THU	FRI	SAT	SUN
1	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
2	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
3	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
4	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
5	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
6	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
7	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	
8	1 Hour (Back/Biceps)	Rest Day	1 Hour (Chest/Triceps)	Rest Day	1 Hour (Shoulders/Core)	Shooting Practice @ Archery Range	

Figure 6 - Overview of Training Schedule

Figure 7 below is the proposed segments for each hourly training session. The short training session is designed to make it easy for the members to find time to execute. Each session is broken down into 3 segments - 10 mins for warm-up, followed by 30 mins for weight training, and 20 mins for cardiovascular exercise.

For the warm-up, we propose the light jogging to warm up the entire body, followed by static or dynamic stretching to activate the joints of the shoulders and arms, as well as the upper body muscles. Members with resistance bands can also use the bands to warm up the joints and muscles. We would like to emphasize that the warm-ups are essential to reduce likelihood of injuries.

For the weight training, members who have access to gym facilities can perform the recommended free weight exercises listed. Those without the equipments can do push-ups. Different variants of the push-ups can focus training on different muscles groups. For example, wide push-ups can engage the shoulders more; close push-ups the triceps; eccentric push-ups that emphasize on the muscle-lengthening phase can stimulate the muscles differently; decline pushups can work more on the upper chest and shoulders. With sufficient repetitions on a suitable weight or body weight, we can focus on endurance training.

For cardiovascular training, due to the limited training time (20 mins), we propose runs consisting of high-intensity segments, like fartlek or interval runs. Members can also climb stairs available at high-rise buildings. The intensity of these exercises should be monitored with a heart-rate monitor so the participants know if they are training at the correct intensity. The participants are also recommended to monitor their heart rates after the exercises at intervals, for purpose described in the previous section. They can also make use of breathing exercises to reduce their heart rates at a faster pace.

Warning - the participants should always listen to their body and reduce the intensity or stop the exercise if they start feeling uncomfortable.

After each training session, the participant should spend some time (indicated as 5 mins below) to warm-down the respective muscle groups to aid recovery.

Weekly 1 Hour Training

Duration	**Segment**	**Exercises**	**Amount**
10 mins	Warm-up	Brisk walk/jog on treadmill or outdoor	5-7 mins
		Stretch & warm-up rotators, arms, chest and back muscles. Archery shooting motions with resistance band.	3 mins
30 mins	Weight & Endurance for Upper Body	Mondays	
		Seated row	3 sets x 12-15 reps
		Lat pull-down	3 sets x 12-15 reps
		Deadlifts	3 sets x 12-15 reps
		Bicep curls (choice of dumbbells/barbell/cable)	3 sets x 12-15 reps
		Dumbbell hammer curls	3 sets x 12-15 reps
		Plank	3 sets x 30-60 secs
		Wednesdays	
		Chest press (choice of dumbbell/barbell/smith machine)	3 sets x 12-15 reps
		Chest flys (choice of stationery machine/ dumbbells)	3 sets x 12-15 reps
		Push-ups	3 sets x 12-15 reps
		Cable triceps push-down (mix of ropes/bar)	3 sets x 12-15 reps
		Triceps overhead extensions	3 sets x 12-15 reps

		Fridays Front Raises (choice of plate/dumbbells/cable/ barbell) Lateral raises (choice of dumbbells/cable) Reverse Flys (choice of dumbbells/cable) Leg raises Crunches on Fitball Side Plank	 3 sets x 12-15 reps 3 sets x 12-15 reps 3 sets x 12-15 reps 3 sets x 15-20 reps 3 sets x 15-20 reps 3 sets x 30-60 secs on each side
20 mins	Cardiovascular	Free choice of 20 mins cardio interval training: bike, jog, cross trainer, stairs climbing	Ratio of 2:1 (Work:Rest)
3 mins	Warm-down	Full body stretch & warm-down rotators, arms, chest and back muscles.	3 mins

Figure 7 - Breakdown of training session

Weekly Progressive Loading for Exercises

Week	Strength & Endurance Exercise	Cardiovascular Exercise	Remarks
1	≤20% 1RM 12-15 reps 5 sets	Maintain HR at ≥60% of max HR for as long as possible	Acclimatization to exercise routines, establish exercise baselines (e.g. establish weight training techniques, 1RM, resting/peak HR) to avoid injuries
2	40-50% 1RM	≥70%	Progressive overloading
3	40-50% 1RM	≥70%	Progressive overloading
4	50-60% 1RM	≥80%	Progressive overloading
5	50-60% 1RM	≥80%	Progressive overloading
6	60-70% 1RM	≥90%	Progressive overloading
7	60-70% 1RM	≥90%	Progressive overloading
8	50-60% 1RM	≥80%	Maintenance before competition

Figure 8 - Recommended progressive overloading.

In order for a muscle to grow, strength to be gained, performance to increase, or for any similar adaptation, we will need to slowly overload in training. The proposed acclimatisation and overloading is shown in figure 8 above.

Specifically for muscle endurance, we are proposing the following weight training ranges:

No. of sets:	5
Repetitions per set:	12-15
Load per repetition:	50-70% 1RM

Shooting Practice at Archery Range

For the weekly weekend practices, the archers can continue with their own once to twice weekly practices. The additional work we require them to do is to log their scores so we can monitor their progress and see how effective their training has been.

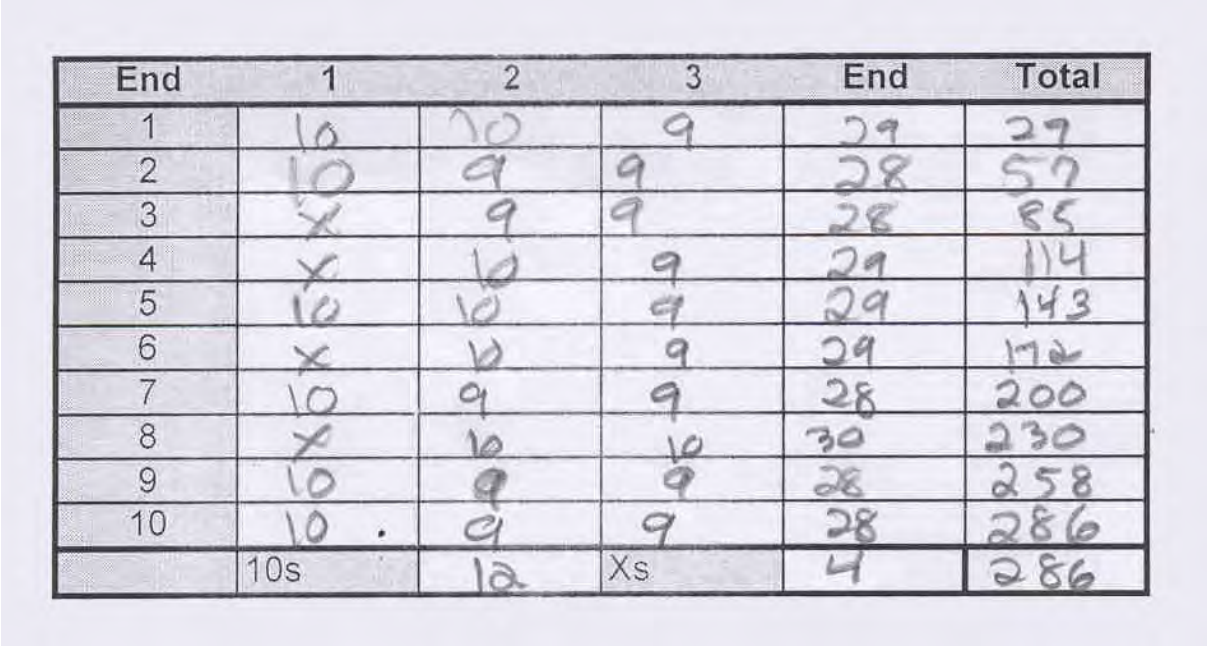
As the periodisation plan may be carried out by the members on their own, they may under- or over-train. Thus logging their performance, and also getting their feedback (e.g. muscle aches, tiredness) will also us to tweak the training for each individual.

We will also warn the members not to over train in the first week, as most of them are not familiar with the technique, and delayed onset muscle soreness (DOMS) caused by eccentric muscle exercises.

3.4 Monitoring Participant's Progress

Monitoring is essential so our participating members can keep track of their progress. Seeing progress will also motivate them to stick to the program as they see improvements. Here are our suggestions to monitoring the progress of our three aims.

Strength and endurance training is carried out together. Although the member can monitor their workout load, or duration they can sustain the exercise, we suggest that they can make use of their weekend archery technique sessions to shoot multiple back-to-back rounds, and keep track of their scores. With improvements in strength and endurance, an archer will be able to shoot multiple rounds continuously with consistent scores without suffering fatigue-induced performance deterioration. Archers have usual habits to take down their score logs, and this can be used to monitor their strength and endurance progress.



End	1	2	3	End	Total
1	10	10	9	29	29
2	10	9	9	28	57
3	X	9	9	28	85
4	X	10	9	29	114
5	10	10	9	29	143
6	X	10	9	29	172
7	10	9	9	28	200
8	X	10	10	30	230
9	10	9	9	28	258
10	10	9	9	28	286
	10s	12	Xs	4	286

Figure 9 - Example of score log for 1 round of 10 ends of 3 arrows. © Bruce Westbrook.

For cardiovascular fitness, we would recommend the members to get fitness trackers, which is easily accessible and easy to use. As our key aim is to get a low resting heart rate (HR), the participant can measure their HR immediately after they complete the exercise, which could be near their maximum HR, and their HR after 1, 3 or 5 minutes of rest. With improved cardiovascular fitness, the HR will drop faster compared to when they were less fit.

4. Other Recommendations

Outside of the purpose of this 8 week periodisation, we can also make the following recommendations:

A. This periodisation plan can be adapted for all members to improve their strength, endurance, and cardiovascular performance, not only those participating in this competition.

B. This periodisation plan can also be used for other archery competitions. However, for competing at further distances or outdoor competitions, we will need to increase the strength and corresponding endurance periodisation, especially for the archers using heavier bows. For example, students participating in the inter-school or national-level events typically shoot at targets between 30-50m. As a reference, Olympic recurve archery is at 70m. Outdoor archery involves elements like wind and rain. Thus using stronger bows are recommended as it allows the arrows to fly at increased speeds, reducing the effect of wind, rain, and gravity.

C. Cardiovascular training is recommended to be conducted on a regular basis. Having good cardiovascular health improves resting heart rate. The archers can also explore other mental focus and calming methods to allow the resting heart rates to be achieved much quicker, letting the archer achieve an optimal mental arousal level.

D. If the members are taking up the training on a regular basis, we recommend them to also look into their food nutrition so they ingest sufficient calories for their added activities, as well as to have a balanced macronutrients intake for muscular development.

E. To assist in lowering heart rate, and lower an athlete’s arousal level to a calm level suitable for shooting events, the members can also explore meditation exercises.

5. Conclusion

Our 8 weeks periodisation plan takes into account the sports person as students and working adults. They are mostly leisure athletes, and training time is very limited. The sport of archery is not intense in nature. It requires a lot of concentration, rather than speed or strength. However, speed and strength are still required at a moderate level, with endurance particularly important to ensure consistent performance shooting arrows after arrows.

With these in mind, we designed the periodisation plan with the 5 principles of training - Specificity, Progressive Overload, Individuality, Variation and Reversibility. The training should match the requirements of the athlete and sport, allow the athlete to adapt and improve, tailored to the limitations of each athlete, provide variations and alternatives, and prevent the athlete from losing performance when we ease training before the competition.

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7. Appendices

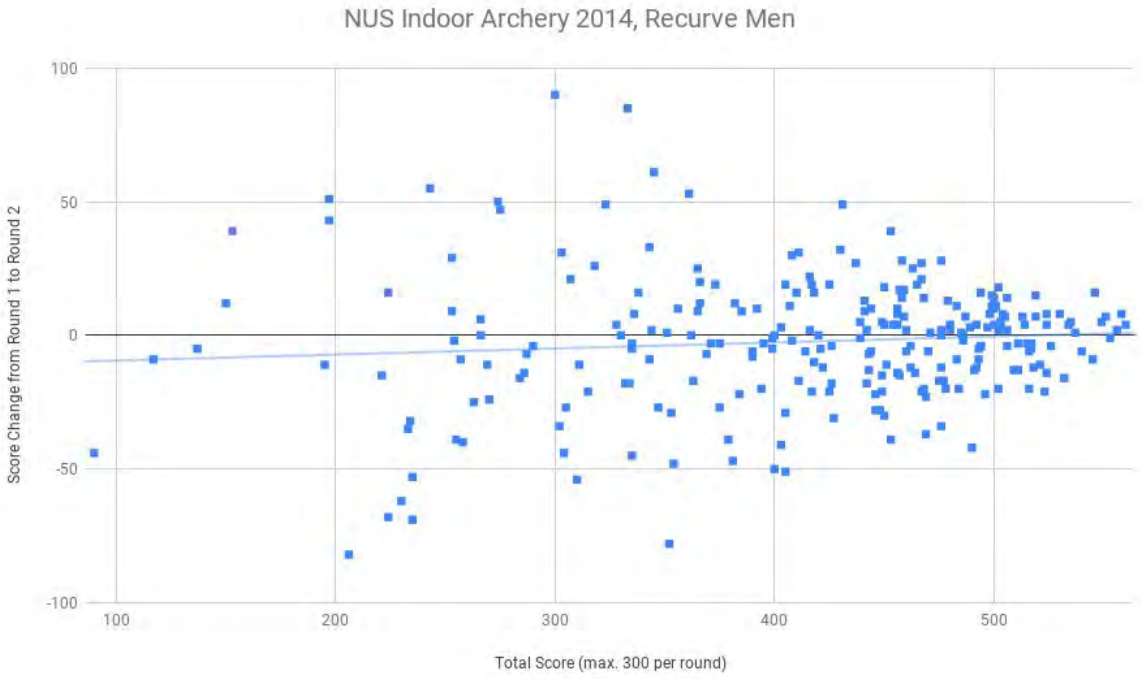
A. Visualisation of Score Differences

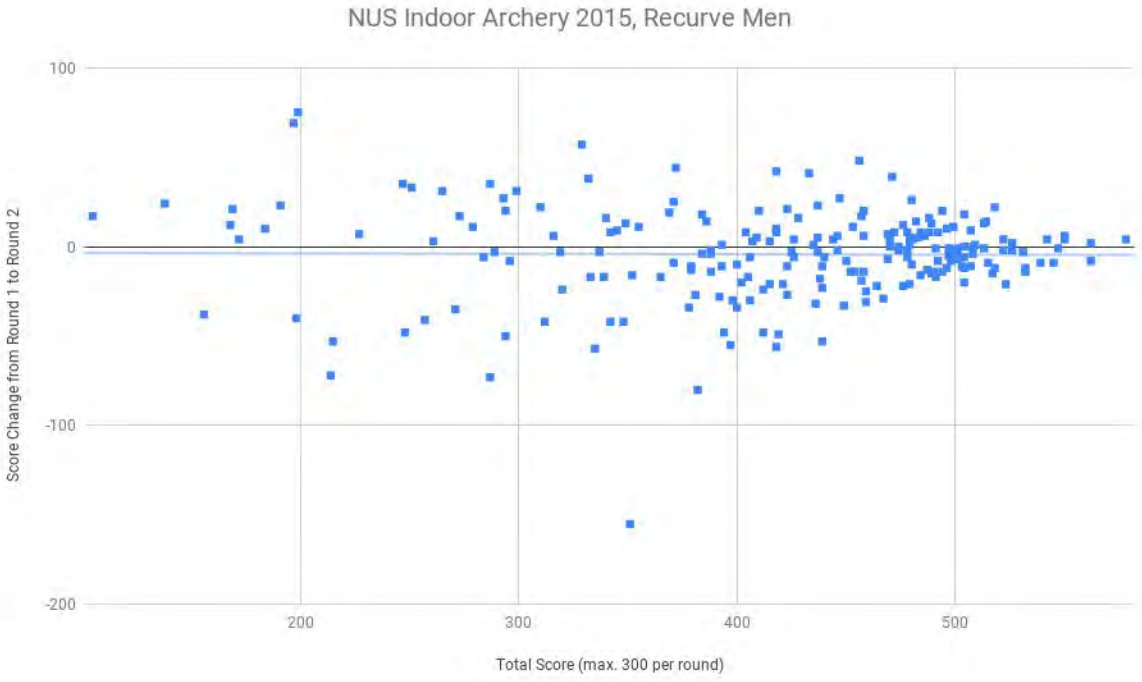
Here is an example of the results for one of the categories. We have the competition scores over 4 years - 2014, 2015, 2017 and 2018. The raw results are available at https://goo.gl/HLQ3gg.

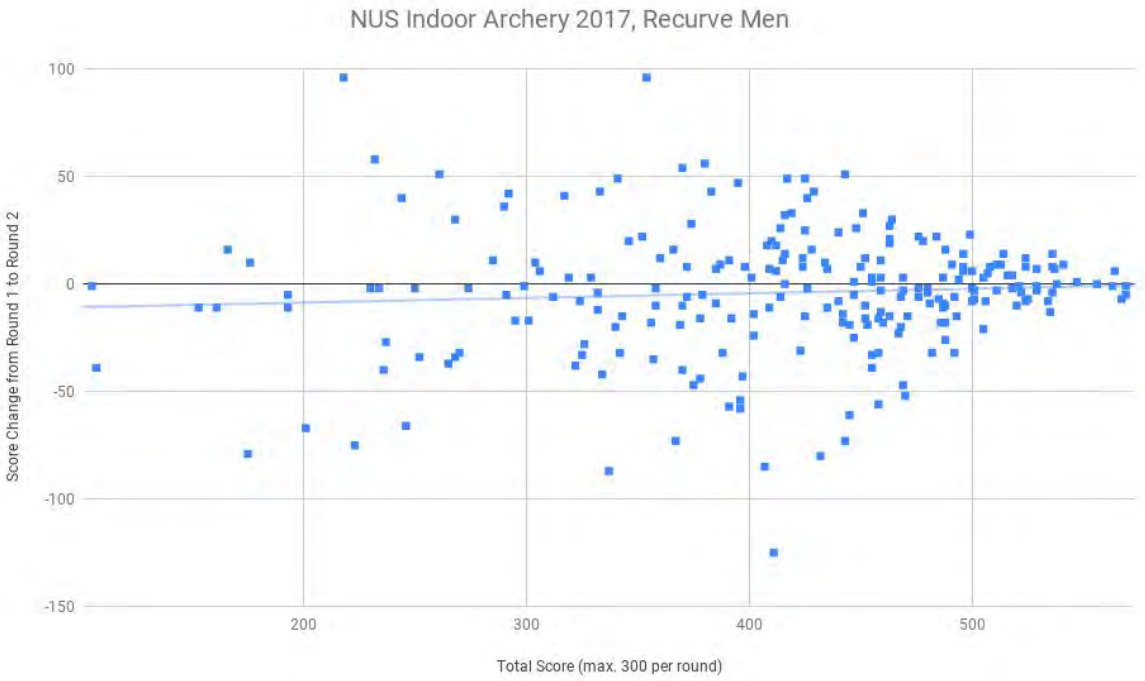
NUS INDOOR ARCHERY CHAMPIONSHIPS 2017
Recurve Intermediate Men's Individual Qualifying Overall
for NUS CHALLENGE

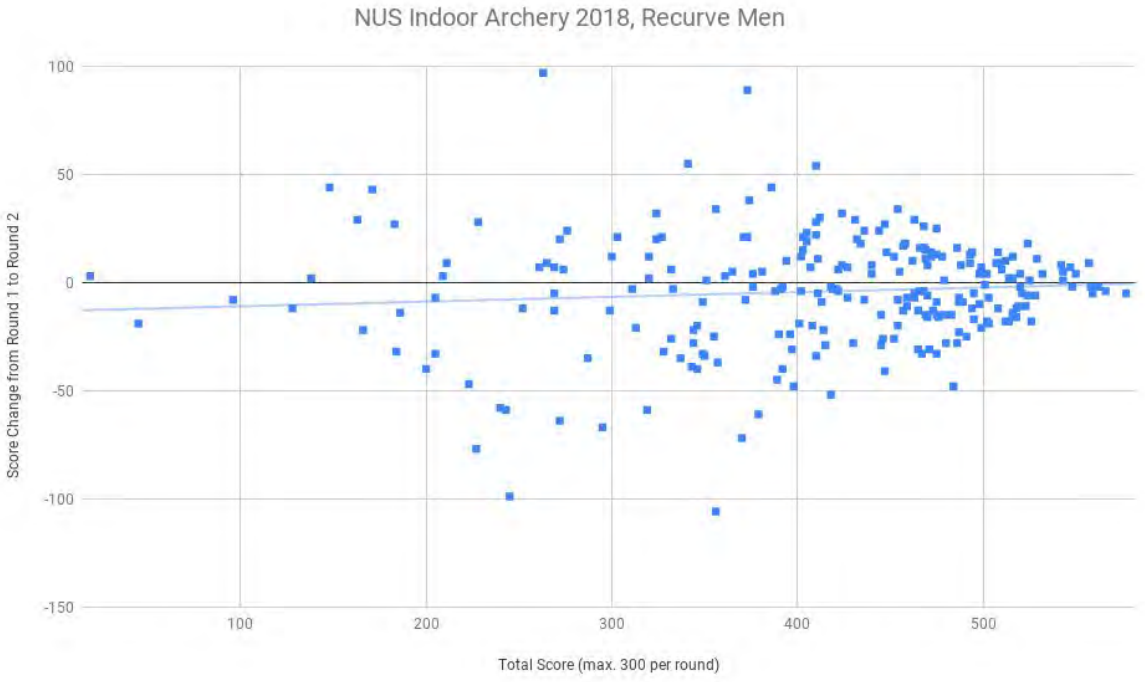
Rank	Name	ets	US Challenge Team Nam	Institutional Team Name	Club	ound	10s	9s	ound	10s	9s	Total	10s	9s
1	Jonas Lim Hong Xiang	18B	NTU Team 7	NTU Team 7	Nanyang Technological University	266	10	11	258	6	12	524	16	23
2	Lee Wei Hao	9C	PPCC - 1		Potong Pasir Community Club	263	8	11	259	5	11	522	13	22
3	Ng Jian Ming	4D	Team Forfeit	Team Forfeit	SP Archery Club	260	9	11	258	6	11	518	15	22
4	Ng Wee Jun	6D	Team WTD	Team WTD	SP Archery Club	250	5	14	264	9	9	514	14	23
5	Wong Sixian Brian	17B	NTU Team 7	NTU Team 7	Nanyang Technological University	257	5	11	254	8	15	511	13	26
6	Xu Cong Yuan	13D			Telok Blangah Archery Club	257	3	15	249	6	9	506	9	24
7	Sim Tzi Kheng	1A	Team Stiff	Team Stiff	National University of Singapore	252	9	7	249	5	8	501	14	15
8	Viriya Vinyatham	18D			Bullseye Archery	246	6	9	248	11	7	494	17	16
9	Lee Yong Jie	3A	Team Stiff	Team Stiff	National University of Singapore	262	7	11	230	4	8	492	11	17
10	Tee Soon Wei Harold	5C			Nanyang Technological University	249	6	7	243	1	14	492	7	21
11	Poh Sewe Hong	20A	FAAC2		Flaming Arrows Archery Club	241	2	13	250	2	13	491	4	26
12	Tay Chi Siong	22B	NTU Team 8	NTU Team 8	Nanyang Technological University	249	6	10	239	4	7	488	10	17
13	Gerard Goh	5B	MSHS TEAM 1		Maris Stella High School	238	5	5	252	5	9	488	10	14
14	Arin Sroisalap	19D			Teerabow Archery	242	10	5	245	4	11	487	14	16
15	Han How Ding Stanley	15B	Team KopiO	Team KopiO	Ngee Ann Archery Club	249	3	10	238	7	6	487	10	16
16	Lwee Jia Ming	11B	Team I1	Team I1	Ngee Ann Archery Club	252	4	11	234	1	12	486	5	23
17	Chung Ling Hao	20B	NTU Team 7	NTU Team 7	Nanyang Technological University	246	3	10	239	3	9	485	6	19
18	Chia Jia Xun Benjamin	1C	NTU Team 8	NTU Team 8	Nanyang Technological University	231	5	7	253	4	10	484	9	17
19	Poon Yong Sheng	15C	China Alliance	China Alliance	Republic Polytechnic	257	7	11	225	0	8	482	7	17
20	Justin Ho Chung Sian	12A	ACS 4		Archery Club of Singapore	245	5	7	236	3	9	481	8	16
21	Chua Kee Chin	21A	FAAC2		Flaming Arrows Archery Club	227	4	5	249	8	6	476	12	11
22	Moh Beng Kit Benjamin	13B	Team I1	Team I1	Ngee Ann Archery Club	261	5	14	209	3	9	470	8	23
23	Chua Wei Ming Edwin	17C	China Alliance	China Alliance	Republic Polytechnic	236	4	11	233	6	9	469	10	20

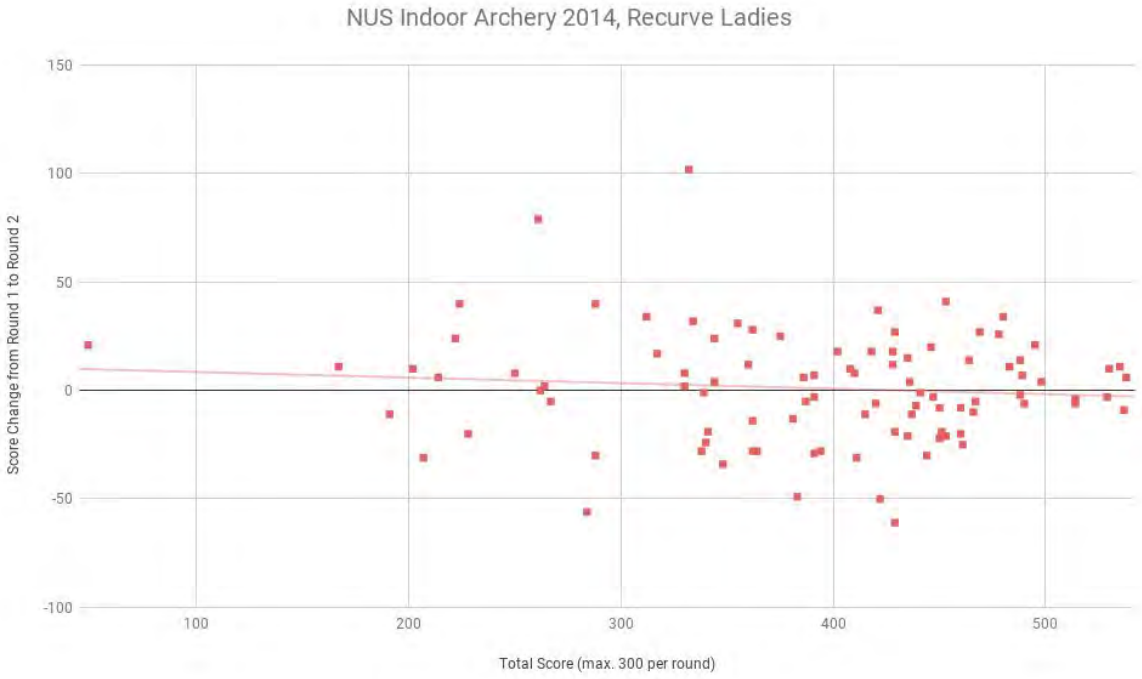
We extracted the scores for each round by sex and plotted following scatter charts.

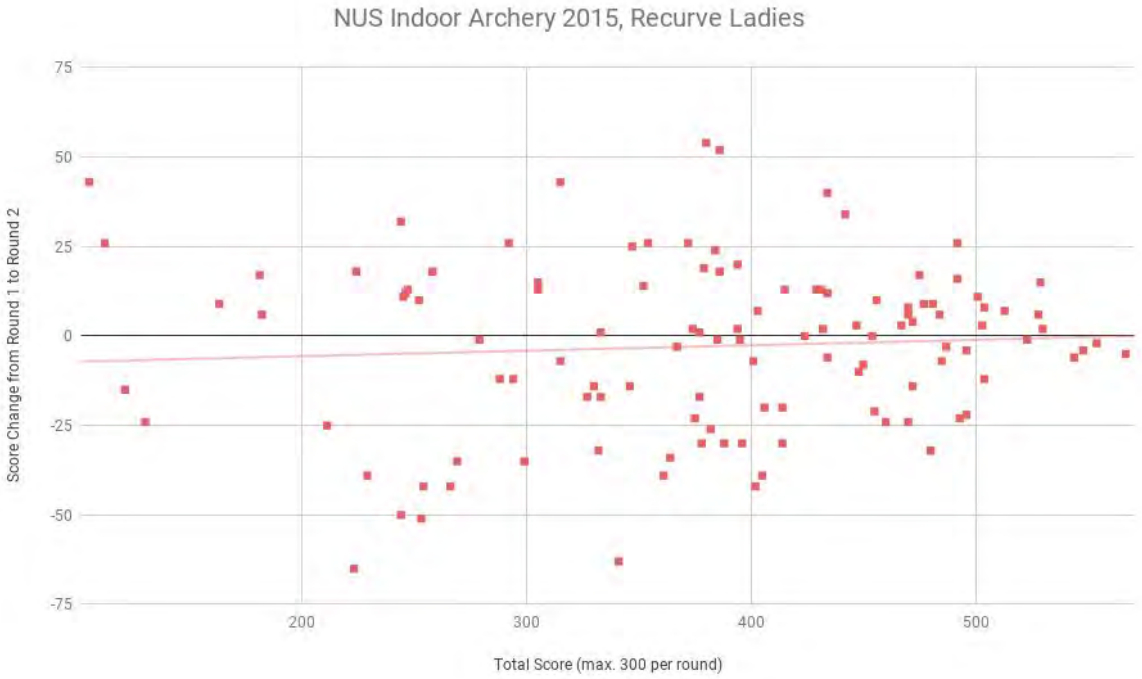

NUS Indoor Archery 2014, Recurve Men
Score Change from Round 1 to Round 2
100
50
0
-50
-100
100
200
300
400
500
Total Score (max. 300 per round)

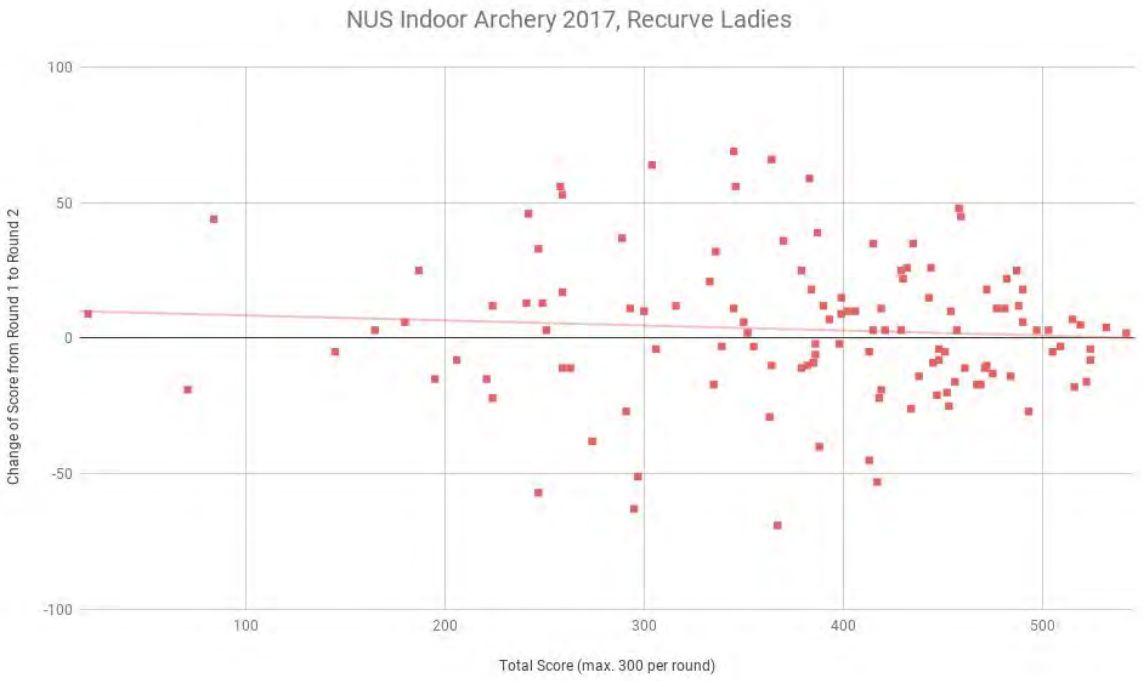

NUS Indoor Archery 2015, Recurve Men
Score Change from Round 1 to Round 2
100
0
-100
-200
200
300
400
500
Total Score (max. 300 per round)

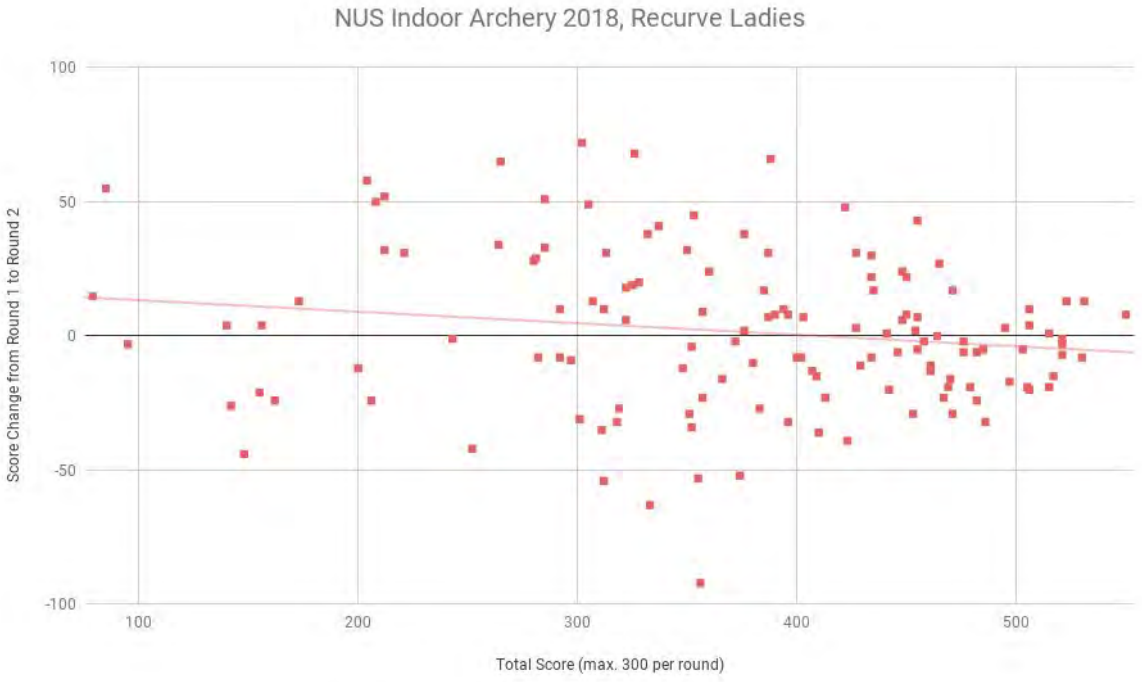

NUS Indoor Archery 2017, Recurve Men
Score Change from Round 1 to Round 2
100
50
0
-50
-100
-150
200
300
400
500
Total Score (max. 300 per round)


NUS Indoor Archery 2018, Recurve Men
Score Change from Round 1 to Round 2
100
50
0
-50
-100
-150
100
200
300
400
500
Total Score (max. 300 per round)


NUS Indoor Archery 2014, Recurve Ladies
Score Change from Round 1 to Round 2
150
100
50
0
-50
-100
100
200
300
400
500
Total Score (max. 300 per round)


NUS Indoor Archery 2015, Recurve Ladies
Score Change from Round 1 to Round 2
75
50
25
0
-25
-50
-75
200
300
400
500
Total Score (max. 300 per round)


NUS Indoor Archery 2017, Recurve Ladies
Change of Score from Round 1 to Round 2
100
50
0
-50
-100
100
200
300
400
500
Total Score (max. 300 per round)


NUS Indoor Archery 2018, Recurve Ladies
Score Change from Round 1 to Round 2
100
50
0
-50
-100
100
200
300
400
500
Total Score (max. 300 per round)