



Current strength and conditioning in Southeast Asia: Practices, challenges, and emerging trends

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Strength and conditioning (S&C) is a field within exercise science that advocates evidence-based practice. As empirical knowledge evolves, translation of this knowledge into coaching practice is expected. However, knowledge translation remains challenging across many industries, particularly S&C, due to varying professional standards and limited resources. This study investigated current practices, challenges, and trends among S&C coaches in Southeast Asia (SEA). Seventy-one S&C coaches (87% male) from major sports organisations completed an online survey covering demographics, job satisfaction, motivation, programming knowledge, AI use, training principles, and exercise methods. Frequency analysis and Chi-square tests assessed data distribution and group differences. Most coaches held a bachelor's degree (93%) and S&C certification(s) (73%). Approximately half (49%) were satisfied with their roles, with mixed views on salary (38% satisfied vs. 38% dissatisfied). Passion (89%) was the primary motivator, while limited facilities (72%) and financial incentives (61%) were common challenges. Coaches reported greater proficiency in strength (87%) than conditioning (57%) programming. AI use within programming (e.g., ChatGPT) was limited (8%). Exercise selection was guided by training goals (93%), experience (87%), specificity (85%), and periodisation (80%). Load intensity and progression were primarily prescribed using percent-based (80% and 85%, respectively) and RPE-based (80%, 72%), with lower use of velocity-based methods (48%, 34%). Application of conventional, eccentric-, concentric-, and isometric-emphasis training were widespread ($\geq 85\%$), with 100% using supersets for strength and hypertrophy development. S&C coaches in SEA demonstrated foundational qualifications, programming skills, and awareness of evidence-based methods, while emphasising athlete-centred approaches and communication. Structured professional development, consideration of AI-based tools, and organisational support are recommended.

Keywords

ChatGPT, exercise prescription, periodisation, resistance training, strength and power

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Introduction

Strength and conditioning (S&C) is a cornerstone of modern athletic preparation, aiming to develop physical qualities that are important for sports performance, while supporting injury prevention, and long-term athlete development.^{1–3} The competitive demands of professional sport drive S&C coaches to explore innovative and emerging strategies to enhance athlete readiness and success.⁴ Contemporary S&C practice incorporates a range of evidence-informed methods, including advanced programming, individualised loading prescriptions, and the use of novel technologies and equipment.^{2,5–7} Training modalities featuring varied muscular actions, such as eccentric⁸ and isometric⁹ exercises, are widely adopted. Coaches also employ diverse prescription strategies like cluster sets,¹⁰ supersets,¹¹ and drop sets,¹² seeking to improve time-efficiency and training stimulus. The volume of “resistance training” research has surged in the past decade, with ~20,100 papers listed on PubMed between 2020–2025, more than double the ~7800 published from 2010–2015 (<https://pubmed.ncbi.nlm.nih.gov/>). As this evidence base continues to expand rapidly, it is critical to examine how effectively knowledge is being translated into practice across global S&C communities.

Recent studies examining S&C practices in North America and Europe have highlighted a growing alignment with evidence-informed approaches, particularly among coaches working in professional settings and those with greater experience.^{7,13} Further studies have examined S&C practices across a range of sports and contexts including Brazilian track and field,¹⁴ Taekwondo,¹⁵ and soccer¹⁶; international judo,¹⁷ South African cricket¹⁸; Chinese high-performance sport,¹⁹ and Iranian Wrestling League.²⁰ These investigations revealed widespread use of structured programming, individualised training, and/or technology-supported monitoring, but also noted variability in implementation across sports and regions.

Despite these insights, the global landscape of S&C remains unevenly represented in the literature. Southeast Asia (SEA), in particular, has received limited attention despite its growing prominence in international sport. Athletes from SEA are consistent medal contenders in Olympic disciplines and world champions in both individual and/or team sports, including badminton, boxing, diving, gymnastics, martial arts (e.g., pencak silat, Muay Thai, wushu), sepak takraw, squash, and weightlifting. The region, comprising 10 countries (11 since October 2025) under the ASEAN (Association of Southeast Asian Nations) framework, also hosts major sporting events such as the SEA Games, held biennially since 1959 and featuring ~40–50 sports and ~5000–10,000 athletes.²¹ The region presents distinct environmental, linguistic, logistical, and cultural factors that may influence how S&C knowledge is applied in practice, including the need to operate within variable

facility and resource availability. Available demographic information indicates that S&C coaches from SEA were mainly certified by the Australian Strength and Conditioning Association (ASCA), rather than certifying bodies from North America (e.g., Certified Strength and Conditioning Specialist from the National Strength and Conditioning Association) and Europe (e.g., Accredited S&C Coach from the United Kingdom Strength & Conditioning Association).²² Nevertheless, the methods and strategies used by these coaches, and the extent to which evidence-based practices are implemented, remain underreported.

Artificial intelligence (AI) conversational tools are modifying work habits across a range of occupations, including exercise prescription²³ and resistance training.²⁴ These tools have the potential to support idea generation and resistance training prescription, thereby enabling S&C coaches to work more time-efficiently.^{23,24} As such, AI-assisted prescription may be particularly useful within initial (draft) programming or when working under time-constrained conditions, thereby helping to reduce perceived time demands and workload pressures.²⁴ Nonetheless, none of the aforementioned studies investigating S&C practices have reported the use of AI conversational tools. Given that the uptake of new technologies often varies by practitioner background, a coach’s experience may influence both their competency and openness to innovative practices, with those exceeding 10 years in the field typically demonstrating more advanced technical expertise and practical judgement.^{25,26} This study is the first to investigate current S&C practices across SEA, comparing sport type (individual vs. team), athlete level (elite vs. sub-elite), and coaching experience (≥ 10 vs. ≤ 6 years). It was hypothesised that coaches with more experience and those working with elite athletes would demonstrate greater application of evidence-informed practices.

Methods

Study design

This cross-sectional online survey-based study investigated practices among S&C coaches as a total cohort, by sport type (individual vs. team), by athlete performance level (elite vs. sub-elite), and by coaching experience (≥ 10 years vs. ≤ 6 years).

Participants

A total of 71 S&C practitioners from seven Southeast Asian countries (Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam) provided informed consent to participate in the study (Table 1). To maintain confidentiality, no identifiable participant information is reported. The study received approval from the Ethics

Table 1. Socio-demographic characteristics of participants (N = 71).

	Frequency	Percent
Sex		
Women	9	13
Men	62	87
Age group		
18–29	22	31
30–39	34	48
40–49	14	20
Over 50	1	1
Country of employment		
Brunei	2	3
Indonesia	5	7
Malaysia	23	32
Philippines	23	32
Singapore	10	14
Thailand	5	7
Vietnam	3	4
Employment status		
Full-time (own country)	55	78
Part-time (own country)	13	18
Full-time (overseas)	1	1
Part-time (overseas)	2	3
Best performing athlete(s)		
World-class	17	24
Elite or international	18	25
Highly trained or national level	29	41
Trained, developmental athletes	7	10
Highest level of (formal) education		
Doctorate degree	7	10
Master degree	16	23
Bachelor degree	43	60
Diploma	4	6
Others (secondary education)	1	1
Certification(s)^a		
ASCA	38	54
NSCA	11	16
UKSCA	1	1
CSCCA (collegiate)	1	1
Other (sport-specific conditioning)	13	18
None	19	27
Primary workplace		
Sports institute or council (or equivalent)	18	25
College or university (or equivalent)	16	23
Professional team-sports club	13	18
Private sector	12	17
Sports association (or equivalent)	9	13
Others	3	4
Monthly income (current S&C role)		
Less than USD 1000	33	47
USD 1000 to 1999	19	27
USD 2000 to 3999	10	14
More than USD 4000	6	8
Prefer not to say	3	4
Weekly training hours in S&C		
Less than 10 h	15	21
10 to 19 h	34	48
20 to 29 h	11	15

(continued)

Table 1. Continued.

	Frequency	Percent
30 h or more	11	15
Primary sport coached		
Basketball	10	14
Football	10	14
Athletics	8	11
Badminton	5	7
Taekwondo	5	7
Volleyball	5	7
Rugby	4	6
Table tennis	2	3
Tennis	2	3
Weightlifting	2	3
Others (18 sports)	18	25
Primary responsibility in S&C		
Strength coach	19	27
Conditioning coach	13	18
Both strength and conditioning	39	55

^aAllowed to choose more than one option.

Committee of Institut Sukan Negara and conducted in accordance with the Declaration of Helsinki.

Procedures

Survey development. The survey was initially developed by the lead investigator and subsequently reviewed by two independent groups (2–3 members each) comprising experienced sports scientists and S&C coaches (holds PhD or master's qualifications). Three additional coaches participated in pilot testing (>10 years S&C experience), which resulted in further refinements before finalisation.²⁷ We adopted the Checklist for Reporting of Survey Studies (CROSS) guidelines to guide the development and reporting of the survey where applicable.²⁸ The final version consisted of 60 items; socio-demographic (12 questions [i.e., 12 items]); satisfaction, motivation, and challenges in strength and conditioning (4 questions); programming knowledge (1 question; 14 sub-questions or items) and AI tool (2 questions); training considerations and principles (3 questions); basic training variables (3 questions; 12 sub-questions or items); exercise types (1 question; 4 items), and methods and configurations (1 question; 9 non-compulsory sub-questions or items); and an open-ended question regarding important lessons and tips in strength and conditioning. The questionnaire is provided as a Supplementary Material (available online).

Data collection. The survey was administered in English via Google Forms (Google LLC, CA, United States). We employed a convenience sampling approach and distributed the questionnaire through our Southeast Asian network, targeting large organisations (e.g., sports institutes, clubs, associations, and colleges/universities) to ensure suitable

standardisation (i.e., known employment standards). The response rate in the current study was not determined. The survey was available online for four months and closed in December 2024.

Statistical analysis

The current study employs descriptive data presentation (in %) for the overall, group (e.g., elite vs sub-elite), and option (e.g., always, often, sometimes) comparisons. An additional Chi-square (χ^2) test for independence was utilised to identify significance for the categorical variables. In cases where χ^2 assumptions were violated (>20% of expected cell counts <5), Fisher's exact test was used as an alternative. The mean and standard deviation was only reported for one variable (number of exercise; overall) and analysed using one-way repeated measures ANOVA. Qualitative terms were used to determine the magnitude of observed frequencies (in %) ^{26,29}: 'all' = 100% of respondents; 'most' = 75–99%; 'majority' = 53–74%; 'half/approximately half' = 48–52%, 'minority' = 26–47%; and 'some' = 1–25%. When the overall distribution exceeds 25% (i.e., minority), the proportion ratio (PR) of ≥ 2.0 (moderate difference) was highlighted to determine the magnitude of differences (e.g., experienced vs less-experienced practitioners). PR thresholds of 1.11 (trivial), 1.43 (small), 2.0 (moderate), 3.3 (large), and 10 (very large), along with their reciprocals (0.9, 0.7, 0.5, 0.3, and 0.1), were applied. ³⁰ Statistical analysis was conducted using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). In addition, the response options 'always' and 'often' are considered 'consistent application / usage.' and further classified as 'application' or 'usage' with the addition of 'sometimes.' For the open-ended questions, inductive analysis was applied, whereby the remarks of respondents were reviewed carefully, organised (key ideas) into categories, and then classified into specific themes related to lessons or tips regarding S&C training; adopted from the work of Byrne. ³¹

Results

The socio-demographic details of 71 participants are shown in Table 1. Respondents were predominantly males (87%), aged 30–39 years (48%). Most practitioners had a minimum education of a Bachelor's degree (93%) and held S&C certification(s) (73%). *Approximately half* of practitioners had worked with International/elite (25%) and/or world-class (24%) level athletes at different sports organisations, including sports institutes (25%), universities/colleges (23%), and professional clubs (18%).

Figure 1 depicts the practitioners' roles and salary satisfaction, motivation, and challenges in S&C. *Approximately half* of the practitioners expressed either 'very satisfied' (31%) or 'almost completely satisfied' (18%) with the

current S&C roles. While 24% rated 'neutral' regarding their salary, others were either satisfied (38%) or not (38%). The primary motivation to work in S&C was mainly about passion (89%). Challenges in S&C primarily include access to quality facilities (72%) and financial incentives (61%).

In terms of S&C training knowledge (Figure 2), *most* practitioners perceived themselves to have greater knowledge of strength training (87%) than conditioning training (57%), especially among experienced practitioners and those who worked with elite athletes. The *majority* perceived themselves to be knowledgeable of speed and power sports (69%) as well as field/ball sports (57%). *Approximately half* were familiar with the S&C training for endurance (48%), sprinting (49%), and jumping (48%) dominant event/sports. *Most* practitioners (77%) had not used an AI tool (e.g., ChatGPT) in designing a resistance training programme (8% have, 15% weren't aware of such functionality). Only 13% perceived that AI can assist in providing effective programme recommendations (Table 2).

The primary factors considered in exercise selection for strength training considerations and principles (Table 3) *mostly* related to training goal (93%), athlete experience (87%), specificity (85%), periodisation (80%), and movement patterns (77%). Load intensity (weight lifted) was mainly determined by either repetition maximum (RM) or rating of perceived exertion (RPE) (80% each) methods, including in the progression of weight lifted (resistance), i.e., 85% used percentage of max and 72% RPE. The velocity-based method was relatively less practiced for load intensity determination (48%) and progression (34%) (Table 3).

For basic training variables (Table 4), on average, the number of exercises performed varied throughout phases ($p < 0.001$), and relatively higher in the preparation phase (9.1 ± 3.4 , or ≥ 7 exercises in 74% practitioners) compared to competition (6.6 ± 2.8), peaking (5.6 ± 2.5), and transition (6.9 ± 3.2). *Most* practitioners prescribed 3–6 sets (92%) in preparation phase with a session duration of 61–90 min (46% practitioners). This prescription shifted to either 3–4 sets (56%) or 1–2 sets (31%) during competition phase. A *majority* considered 1–2 sets (54%) during peaking period, and 3–4 sets (70%) during the transition. These changes were reflected in a relatively shorter training duration (Table 4).

In terms of exercise types (Figure 3), the application (i.e., *always, often, sometimes*) of conventional (eccentric/concentric, 98%), eccentric- (93%), concentric- (89%), and isometric- (85%) training emphases was very common; *most* practitioners considered conventional methods (*always* 66%, *often* 23%) in training prescription. Concentric emphasis training (21% and 30% respectively) as well as eccentric emphasis (21% and 38%), and isometric emphasis (28% and 21%) were commonplace.

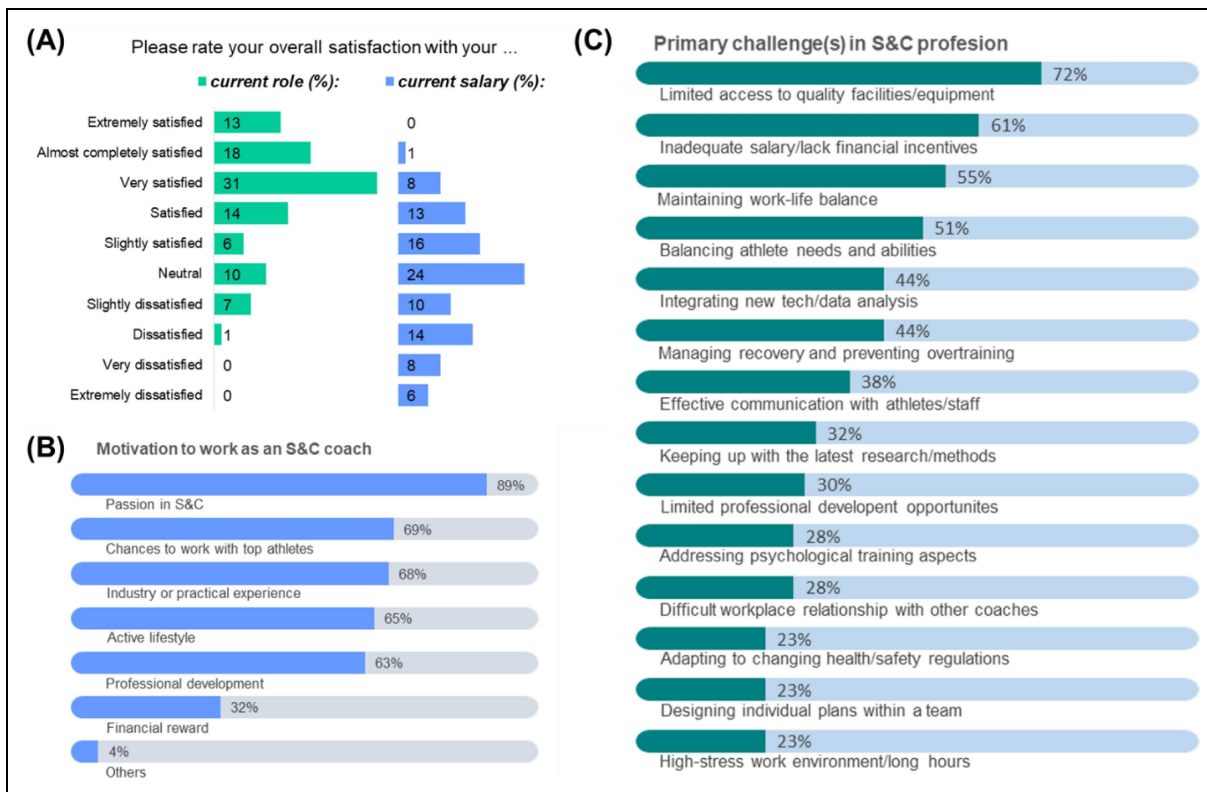


Figure 1. Roles and salary satisfaction, motivation, and challenges in strength and conditioning. Question (for 'C' – allowed to select multiple answers): “What are the main challenges you have experienced in your strength and conditioning profession?”.

Training configurations for strength and/or hypertrophy development (Figure 4) mainly considered a superset system (*always* 28%, *often* 56% [84%] or 100% application). The *majority* also utilised straight sets (*always* 28%, *often* 34% [62%]) and compound sets (*always* 23%, *often* 34% [57%]). Occasionally, practitioners used repetitions in reserve (*always/often* 38%, *sometimes* 36% [74% application]) and cluster set (*always/often* 34%, *sometimes* 36% [70% application]) methods.

Finally, for the open-ended question (Figure 5), the primary themes regarding lessons and recommendations (tips) in S&C were classified as training, relationship, expertise, and monitoring. Sub-themes (summary) are presented in Figure 5. Almost all group comparisons (elite vs sub-elite; individual vs team; experienced vs less-experienced) were not statistically significant.

Discussion

This study characterised current S&C practices among practitioners in SEA region. More than two-thirds of respondents were male, under 40 years of age, held undergraduate qualifications, possessed international certifications, and had experience working with elite athletes. ‘Passion’ was the primary motivator for working in S&C, while common challenges included limited access to quality

facilities and insufficient financial incentives. Coaches reported greater perceived knowledge in ‘strength’ rather than ‘conditioning’ training prescription, particularly those with more experience and working in speed–power sports. AI tools (e.g., ChatGPT) were rarely used in programme design. The application of basic variables (sets, repetitions) was guided by training phase (periodisation), with exercise choices depending on training goal, athlete experience, and specificity, among others. Load intensity prescription was predominantly percent-based, followed by RPE. Most S&C coaches preferred conventional (eccentric/concentric) training methods, but other prescription methods (concentric, eccentric, and isometric emphasis) were commonplace. Supersets, as well as compound and straight sets, were preferred for strength and/or hypertrophy development. Although we hypothesised that more experienced S&C coaches and those working with elite athletes would demonstrate greater evidence-informed practices, we found no statistical differences in nearly all S&C practices across groups, based on experience, athlete level and sport type.

Participants were *mostly* educated to at least undergraduate level (93%), predominantly male (87%) and under the age of 40 (79%). This demographic profile reflects a broader sex imbalance within the profession,^{7,13,32,35} including in Southeast Asia,²⁶ which is also aligned with sex imbalances within research participants across sport and exercise

	Good	Limited		Good	Limited
Strength training	87	13	Conditioning	57	43
Individual, %	86	14	Individual, %	57	43
Team, %	85	15	Team, %	56	44
Elite, %	89	11	Elite, %	69	31
Sub-Elite, %	83	17	Sub-Elite, %	44	56
≥10 years, %	97	3	≥10 years, %	73	27
≤6 years, %	77	23	≤6 years, %	42	58
Cycling	31	69	Sprinting dominant	49	51
Individual, %	38	62	Individual, %	46	54
Team, %	24	76	Team, %	56	44
Elite, %	31	69	Elite, %	49	51
Sub-Elite, %	31	69	Sub-Elite, %	53	47
≥10 years, %	37	63	≥10 years, %	50	50
≤6 years, %	26	74	≤6 years, %	48	52
Jumping dominant	48	52	Throwing dominant	23	77
Individual, %	46	54	Individual, %	27	73
Team, %	47	53	Team, %	24	76
Elite, %	60	40	Elite, %	37	63
Sub-Elite, %	33	67	Sub-Elite, %	14	86
≥10 years, %	57	43	≥10 years, %	33	67
≤6 years, %	39	61	≤6 years, %	13	87
Swimming	38	62	Speed and power	69	31
Individual, %	43	57	Individual, %	70	30
Team, %	32	68	Team, %	71	29
Elite, %	29	71	Elite, %	71	29
Sub-Elite, %	47	53	Sub-Elite, %	69	31
≥10 years, %	33	67	≥10 years, %	80	20
≤6 years, %	42	58	≤6 years, %	58	42
Strength dominant	74	26	Endurance	49	51
Individual, %	81	19	Individual, %	49	51
Team, %	62	38	Team, %	47	53
Elite, %	86	14	Elite, %	46	54
Sub-Elite, %	58	42	Sub-Elite, %	50	50
≥10 years, %	87	13	≥10 years, %	50	50
≤6 years, %	61	39	≤6 years, %	48	52
Ball or field	57	43	Combat	43	57
Individual, %	51	49	Individual, %	38	62
Team, %	68	32	Team, %	44	56
Elite, %	69	31	Elite, %	43	57
Sub-Elite, %	50	50	Sub-Elite, %	39	61
≥10 years, %	63	37	≥10 years, %	43	57
≤6 years, %	52	48	≤6 years, %	42	58
Precision	26	74	Racquet	38	62
Individual, %	22	78	Individual, %	38	62
Team, %	29	71	Team, %	38	62
Elite, %	29	71	Elite, %	43	57
Sub-Elite, %	22	78	Sub-Elite, %	33	67
≥10 years, %	33	67	≥10 years, %	43	57
≤6 years, %	19	81	≤6 years, %	32	68

Figure 2. Ability to prescribe strength training and conditioning training (%). Question; “How would you rate your (current) ability to prescribe training (overall knowledge level) in the following domains and/or events?”.

Table 2. Use of AI conversational tool for programming by total cohort, sports type, athlete level and experience (%).

	Total respondents (n)	Sport type		Athlete level		Experience	
		Individual (%)	Team (%)	Elite (%)	Sub-elite (%)	≥10 years (%)	≤6 years (%)
(a) Have you used AI (e.g., ChatGPT) in the design of resistance training programmes?							
Yes	8	8	6	9	6	13	3
No	77	76	79	77	78	83	71
I didn't know it could write training programmes	15	16	15	14	17	3	26
(b) How do you view the use of AI (e.g., ChatGPT) in the design of resistance training programmes?							
AI can assist human coaches by providing programme recommendations	13	16	6	11	11	17	10
AI might be useful, but it could create ineffective training programmes	18	16	18	17	17	17	19
AI can independently create effective programmes without the need for human coaches	2	3	0	0	3	0	3
I have not tried (or have rarely tried) using AI for training programme design	39	43	44	46	42	33	45
I'm not sure or don't know	20	16	24	20	19	23	16
Other	8	5	9	6	8	10	6

Table 3. Strength training considerations and principles based on total cohort, sport type, athlete level, and experience (%).

	Total	Sport type		Athlete level		Experience	
		Individual	Team	Elite	Sub-Elite	≥10 years	≤6 years
(a) What are the primary factor(s) you consider in exercise selection for strength training?							
Training goal	93	95	94	100	89	93	94
Periodisation	80	78	88	74	92	83	77
Athlete experience	87	86	91	91	86	80	94
Movement patterns	77	78	74	69	83	70	84
Specificity	85	84	82	86	81	87	84
Variety (variation)	61	51	68	57	61	60	61
Equipment availability	74	73	74	69	78	63	84
Other	2	3	3	3	3	3	0
(b) How do you determine "load intensity" (weight lifted) in strength training prescription? Based on:							
Repetition maximum (RM)	80	81	85	77	89	77	84
Ratings of perceived exertion	80	81	76	71	86	70	90*
Velocity	48	43	53	57	39	50	45
Previous experience	44	49	44	40	53	50	39
Trial and error	43	41	44	40	44	53	32
Predict from other exercises	31	16	41*	20	36	37	26
I do not determine	3	5	0	3	3	0	6
Other	0	0	0	0	0	0	0
(c) How do you determine "load progression" (weight lifted or resistance) in strength training?							
Percentage of maximum	85	86	88	89	86	83	87
Rate of perceived exertion	72	70	76	54	92*	57	87*
Autoregulation	34	35	41	43	33	40	29
Fixed increments	36	41	29	31	39	20	52*
Other	0	0	0	0	0	0	0

Note: (a) Periodisation (i.e., phases of training), athlete experience (skill level), movement patterns (e.g., push, pull, rotation), specificity (relevant to sport/event); (b) Trial and error (i.e., adjustment through sets); loads from other exercises (predicted); (c) percentage of max (e.g., 85%, 90%, 95%); autoregulation (e.g., velocity based); fixed increments (e.g., week 1: 100 kg, week 2: 110 kg, week 3: 120 kg, etc.). Practitioners were allowed to select multiple answers. Between-group difference ($p < 0.05$) is marked with an asterisk (*).

Table 4. Basic training variables (number of exercise, set, and session duration) through all training phases by total cohort, sport type, athlete level, and experience level (%).

Number/set/duration	Total (%)	Sport type		Athlete level		Experience		
		Individual, %	Team, %	Elite, %	Sub-Elite, %	≥10 years, %	≤6 years, %	
How many exercises do you typically prescribe for a strength training session?								
Preparation	≤6	26	27	21	23	25	30	23
	7–10	43	46	50	49	47	33	52
	>10	31	27	29	29	28	37	26
Competition	≤6	57	59	65	54	69	57	58
	7–10	34	35	26	37	25	33	35
	>10	8	5	9	9	6	10	6
Peaking	≤6	75	76	82	77	81	83	68
	7–10	20	19	15	14	19	13	26
	>10	5	5	3	9	0	3	6
Transition	≤6	56	59	53	54	58	53	58
	7–10	30	32	26	31	28	37	23
	>10	15	8	21	14	14	10	19
How many set(s) per exercise do you commonly prescribe in training sessions?								
Preparation	1–2 sets	5	8	0	6	3	3	6
	3–4 sets	64	57	74	66	64	63	65
	5–6 sets	28	27	26	26	28	33	23
	>6 sets	3	8	0	3	6	0	6
Competition	1–2 sets	31	24	35	29	31	23	39
	3–4 sets	56	59	50	60	50	63	48
	5–6 sets	10	8	15	9	14	13	6
	>6 sets	4	9	0	0	6	0	6
Peaking	1–2 sets	54	43	62	51	53	57	52
	3–4 sets	38	38	35	40	33	37	39
	5–6 sets	7	16	0	3	14	7	6
	>6 sets	2	3	3	6	0	0	3
Transition	1–2 sets	21	8	38	11	33*	13	29
	3–4 sets	70	84*	53	80*	58	77	65
	5–6 sets	7	5	9	6	8	10	3
	>6 sets	2	3	0	3	0	0	3
On average, how long is your training duration per (main) training session?								
Preparation	≤30 min	0	0	0	0	0	0	0
	31–60 min	26	27	24	20	31	17	35
	61–90 min	46	41	53	46	47	47	45
	91–120 min	21	24	21	26	19	30	13
	>120	7	8	3	9	3	7	3
Competition	≤30 min	16	5	26*	6	25*	10	23
	31–60 min	49	49	44	49	44	43	55
	61–90 min	21	24	26	29	22	27	16
	91–120 min	10	14	3	11	6	17	3
	>120 min	4	8	0	6	3	3	3
Peaking	≤30 min	26	11	44*	20	33	23	29
	31–60 min	49	54	44	51	47	47	52
	61–90 min	18	24	12	17	19	23	13
	91–120 min	3	5	0	6	0	3	3
	>120 min	4	6	0	6	0	3	6
Transition	≤30 min	16	11	21	11	19	17	16
	31–60 min	43	41	47	43	44	37	48
	61–90 min	34	38	32	37	33	37	32
	91–120 min	3	5	0	3	3	7	0
	>120 min	4	6	0	6	0	3	3

Note: Between-group difference ($p < 0.05$) is marked with an asterisk (*).

sciences.³³ These findings highlight a need for SEA countries to promote greater female representation in S&C roles. Weldon et al.¹³ reported that the majority of S&C cohort (mainly from US, UK, China, and Spain) held a Master's degree (65%), followed by a Bachelor's degree (25%). Employment requirements are varied, with many employers not requiring a Master's or a PhD qualification.³⁴ The majority of coaches in the present study had experience working with elite athletes and held international S&C certifications (73%), similar to those reported (71%) by Weldon et al.¹³ The ASCA accreditation (Australia) was most common (54%), likely due to proximity or regional influence.²²

A proportion of respondents expressed satisfaction with their current role (*approximately half*, 49%; Figure 1). Notably, most S&C coaches (89%) identified *passion* as their primary source of motivation, often linked to personal fulfilment derived from a connection to sport and related factors.³⁵ This reinforces a similar recent finding among sport scientists in China.³⁶ Furthermore, access to quality facilities was the main challenge identified (72%), although S&C coaches globally are widely reported to adapt training to available resources.¹³ Limited financial incentives (61%) were also highlighted (Figure 1), as has been highlighted in responses by Chinese sport scientists.³⁶ However, it worth noting that financial recompense may not always be a primary motivational factor for those working within S&C.³⁷ In this survey, 47% of S&C coaches earned under USD \$12,000 annually (38% expressing salary dissatisfaction, Figure 1), far below the USD \$61,000 to \$85,000 average reported for NSCA (National Strength and Conditioning Association) members³⁸ and those in the United Kingdom (USD \$25,000 to \$36,000).³⁹

Regarding programming knowledge, most S&C coaches felt they possessed the knowledge to prescribe effective strength training programmes (87%), but only 57% felt confident doing so for conditioning. This gap may reflect the role responsibilities of respondents, with just 55% of respondents managing both strength and conditioning responsibilities, while only 18% focused primarily on conditioning (Table 1). Plausibly, this may also reflect role overlap with exercise physiologists, as well as conditioning led by sport-specific coaches (e.g., plyometrics and resisted sprints in track and field, and small-sided games in team sports). Interestingly, coaches with over 10 years of experience, particularly within speed and power sports (69%), reported greater confidence in conditioning programming than those in skill-based disciplines such as combat, racket, or precision sports. However, as the field evolves, S&C coaches are increasingly expected to possess a broader range of S&C knowledge and skills.³⁴ Factors such as certification, experience level, and professional attitudes influence strength training competency.⁴⁰ These findings support the need for stronger collaboration between S&C specialists and targeted S&C education to enhance applied knowledge in conditioning design.

AI conversational tools are now widely accessible and potentially useful for exercise prescription,^{23,24} however in the current study, most S&C coaches had not adopted AI tools such as ChatGPT for training design (only 8% reported previous use), even two years after its release. Only 13% believed AI could assist their work, 18% viewed AI-generated programmes as ineffective, while 39% indicated that they had never (or had rarely) tried using AI, suggesting low exposure – rather than strong negative attitudes – may be contributing to the low adoption. Despite low uptake, AI may offer value in supporting S&C programming across SEA, particularly for generating ideas and drafting plans for large athlete groups.^{23,24}

The application of basic variables (sets, repetitions) was guided by training phase (periodisation), with exercise choices primarily influenced by training goal, athlete experience, and specificity. This approach aligns with NSCA guidelines, which emphasise the importance of understanding exercise types, sport-specific demands, technical proficiency, and available resources for effective S&C programming.¹ Importantly, variables such as sets and repetitions must be specific to training objectives, such as strength, hypertrophy or power, which may occur sequentially (block periodised training) or in a parallel manner (undulating) within periodisation and programming.¹ Coaches prescribed more exercises during preparatory phases, and then reduced during the 'peaking' periods, likely aiming to achieve an appropriate (reduced) training volume for enhanced preparedness.⁴¹ This approach also corresponded with the training duration spent for strength training, typically ranging from 30 to 90 min. In this context, training goals during training sessions may change from specific situations (e.g., injury, change in competition schedule), necessitating "flexibility" in programming.²⁶ These findings demonstrate that S&C coaches in SEA are actively applying structured periodisation strategies, demonstrating alignment with global best practices.

In this study, S&C coaches primarily prescribed load intensity using repetition maximum (80%) and RPE (80%), both recognised as effective strategies for guiding training intensity.⁴² These approaches reflect the broader principle that appropriate training structure considers appropriate load intensity for effectiveness.¹ Similarly, load progression (weight lifted) was rarely 'auto-regulated' via velocity-based training (34%), relying instead on percent of maximum (85%, *large PR*) as well as RPE (72%, *large PR*), especially among inexperienced coaches (87% vs 57%) and those with sub-elite athletes (92% vs 54%). This difference likely reflects individual-coach preference, with RPE-based training being associated with slightly higher training volume/intensity than percent-based training.⁴² Surprisingly, Weldon et al.¹³ reported considerably lower application of these methods (percent-based: 45%, and RPE: 49%) in a cohort of international S&C practitioners. '*Approximately half*' (48%) of S&C coaches



Figure 3. Exercise types as shown by total cohort, sports type, athlete level, and experience (%). Question; “Do you prescribe the following exercise types?”.
 Note: Always (all year round, consistently), often, sometimes (particular training phase), rarely, never, I don’t know.

considered utilising velocity data, but more than that reported (31%) in 17 countries.¹³ We observed that S&C coaches of elite athletes used velocity to set training loads more than those working with sub-elite populations (57% vs 39%), possibly due to funding availability for purchasing specialised equipment. Nonetheless, it’s worth noting that velocity-based training can overestimate load capacity and has been suggested to offer no strength advantage over traditional methods.⁴³

The application of conventional, eccentric-, concentric-, and isometric-training emphases was very common (≥85%). Conventional training (~98%) was most consistently prescribed (Figure 3), with nearly 90% of coaches reporting ‘always’ or ‘often’ (consistent application) using traditional ‘concentric/eccentric’ methods, reflecting their broad practicality and transfer to performance.¹ Eccentric-emphasis methods, while effective for strength, hypertrophy, and tendon adaptation,⁴⁴ were more selectively applied (‘sometimes’ or ‘often’). Concentric emphasis was commonly used for power development, alongside strength and hypertrophy, and often manipulated via tempo.⁴⁵ Isometric methods, beneficial for joint-angle-specific strength,⁹ were less frequently integrated year-round. These findings indicate a greater prevalence of conventional resistance training prescription,

although usage of alternative contraction types (muscle actions) was observed, in line with expanding evidence for performance and injury-prevention benefits from these approaches.

For strength and hypertrophy development, the superset system was used unanimously among the surveyed S&C coaches (Figure 4). This application is likely because this method can result in similar strength improvements, while being highly time-efficient.⁴⁶ Compound sets (performed more than one exercise within a single set) as well as straight sets, appeared to be applied more than other set configurations. Despite the simplicity of straight sets, compound sets may not provide the same advantage (i.e., time efficiency) as supersets and strength development may be inferior to traditional approaches.⁴⁷ Cluster set use has been increasing in recent years as it may reduce fatigue.⁴⁸ However, it may be less time efficient due to the increased time requirement for intra-set rest. Hence, this may explain the limited application among the S&C coaches surveyed.

Thematic analysis identified several lessons in S&C, with individualised programming, good communication, relationship-building, monitoring, and continuous learning emerging most frequently (Figure 5). These findings show that effective S&C practice extends beyond technical expertise to include interpersonal (e.g., effective interaction

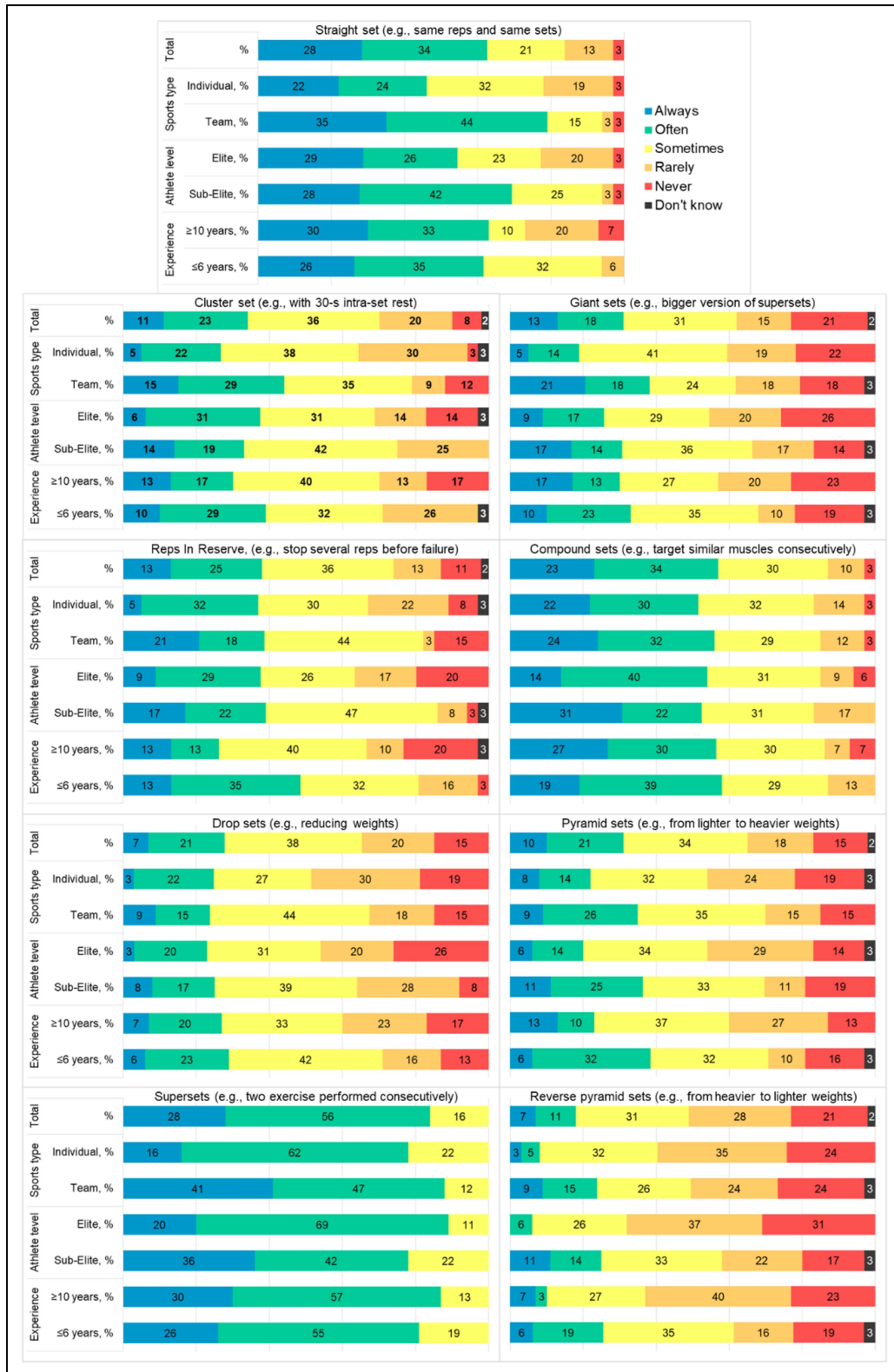




Figure 4. Training configurations for strength and/or hypertrophy development based on total cohort, sport type, athlete level, and experience (%). Question; “Do you employ the following training configurations (sequence and loading) in your training prescription for strength and/or hypertrophy?”.

- Improving AI literacy may enhance work convenience and S&C practices (e.g., drafting programmes, data interpretation, and evidence synthesis).
- Implementing creative, low-cost (alternatives) training solutions can help optimise training outcomes where resources are limited, while sports organisations may advocate for better recognition and performance-based rewards to support staff motivation and retention.
- SEA coaches may consider integrating velocity tracking and ‘contraction-specific’ strategies (e.g., eccentric, concentric, and/or isometric training) to aid training monitoring and individualisation.
- Upskilling opportunities, mentorship, and collaboration with other S&C professionals are recommended to further enhance applied knowledge and practice, thereby also supporting broader workforce development, including attracting and increasing female representation in S&C.

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Ethical considerations

Ethics was approved by the National Sports Institute of Malaysia (Institut Sukan Negara) in accordance with the Declaration of Helsinki.

Consent to participate

All participants provided informed consent electronically before completing the survey.

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Data availability

The datasets generated and analysed in this study are available from the corresponding author upon reasonable request.

Supplemental material

Supplemental material for this article is available online.

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