

Stress, coping, coping effectiveness and emotions in Malaysian Elite tenpin bowlers: Role of context and importance

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Professional tenpin bowlers were examined for their stressors experienced, coping, coping effectiveness and emotional reactions prior to and during minor and major competitions. Fifteen tenpin bowlers (male $n = 6$; female $n = 9$) completed a diary pack on three separate periods: one minor competition period and two major competitions periods. Tenpin bowlers completed a diary to report their stressor encounters, coping strategies, coping effectiveness, resulting emotions and their intensity on a daily basis. Results showed that the tenpin bowlers experienced a limited ($n = 5$) number of stressors over time which accounted for 95% of the stressors reported, almost similar to those observed in Caucasian athletes. However, unlike Caucasian athletes our sample reported a similar number of positive and negative emotions. Context (training vs. competitions) and the importance of the competition were found to influence stress and coping process especially at the level of individual stressors. Findings suggest a need to further examine cultural similarities and differences in the stress, coping and emotion process among athletes to prevent misunderstanding and miscommunication. This will allow the development interventions which are not only situation and context specific but also culturally sensitive.

Keywords: Elite Asian Athletes; stress; coping; emotions; cultural differences

Introduction

Psychological factors play an important role in sport performance (Raglin, 2001). Coping with stress during both competition and training (Nicholls, Levy, Grice, & Polman, 2009) is one such psychological factor (Polman, 2012). For example, the use of maladaptive coping strategies has been shown to be associated with decreased performance (Haney & Long, 1995) and performance satisfaction (Nicholls, Polman, & Levy, 2012) in athletes. It is therefore important for practitioners, including sport psychologist and coaches, to have an in-depth understanding about the stressors, coping strategies used, their effectiveness and emotions generated by athletes. This will help in the development of better intervention programmes for athletes towards optimising performance during training and competition.

The transactional model of stress, coping and emotions (Lazarus, 1999) is the most widely used in sport (Nicholls & Polman, 2007a). This model posits stress, coping and emotions as belonging together forming a conceptual unit. Although Lazarus suggested that these concepts should be examined as a unit, this is not often practised in research. An important possibility

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is that such research often places undue demands on the athlete. However, diary studies have been shown to be effective to collect data on a number of the proposed variables over time.

Numerous studies have examined the stressors experienced by athletes during competition, training or outside the sporting environment. Although it has been suggested that there are potentially an infinite number of stressors, longitudinal diary studies have indicated that most athletes only reported a limited number of stressors which reoccur over time (see Polman, 2012, for a review). Contextual factors are believed to influence the type of stressor and the intensity of the stress experienced. For example, the type of stressors varies between athletes competing in different sports. Rugby athletes seem to be particularly worried about sustaining injuries (Nicholls, Holt, Polman, & Bloomfield, 2006), whereas golfers are concerned about changing weather conditions (Nicholls, Holt, Polman, & James, 2005). Also, more stressors are experienced during training than in competition but during the later athletes experience higher levels of stress (Nicholls, Levy et al. 2009). However, few studies have examined whether competitions of different importance generate different stressors and the coping responses to these stressor.

Strategies to cope with stresses have been classified in three higher order dimensions (Nicholls & Polman, 2007a). Problem-focused coping (PFC) refers to those strategies which deal with the problem and include increasing effort, seeking information and goal-setting. Emotion-focused coping (EFC) dimension consists of strategies to regulate emotional distress and include breathing, relaxation and venting. Finally, avoidance coping (AVC) consists of strategies to either cognitively (e.g. blocking) or behaviourally (e.g. walking away) disengage from the stressor. Although current research has examined the coping strategies of athletes, there is limited information on which coping dimensions or strategies are used when similar stressors are encountered over time.

Coping effectiveness has been defined by Nicholls (2010, p. 264) as “the degree in which a coping strategy or combination of strategies is or are successful in alleviating stress”. Sometimes coping strategies used by athletes dealing with stressors are not always effective. In addition, the context also seems to influence coping effectiveness. Nicholls, Jones, Polman, and Borkoles (2009) reported significant differences in stressors and coping responses during training and competition among five professional Rugby Union players. They found that coping effectiveness was significantly higher during training as opposed to during competition. Relatively few studies have assessed coping effectiveness (e.g. Nicholls & Polman, 2007b; Nieuwenhuys, Vos, Pijpstra, & Bakker, 2011) despite the notion that in order to develop effective coping interventions, more information on what do and do not work for the athletes when faced with a specific stressful event are needed (Folkman & Moskowitz, 2004). In addition, the influence of the context on coping effectiveness has been largely ignored. Therefore, this study examined the effectiveness of coping strategies used by professional tenpin bowlers during competitions of varying importance (i.e. minor and major competition) prior to and during competition for specific stressors.

Emotions are generated throughout the coping process and as a consequence of the outcome of a stressful situation (Folkman, 1997). The first coping task is usually aimed to down-regulate negative emotions that are threatening or harmful, which might interfere with the subsequent coping process (Folkman & Moskowitz, 2004). Positive and negative emotions, in this respect, are viewed as independent and both can be experienced at the same time (Larsen, McGraw, & Cacioppo, 2001). Indeed, a recent study suggests that athletes experience mixed emotions simultaneously (Nicholls, Hemmings, & Clough, 2010). The use of adaptive coping responses is likely a consequence of the emotions experienced. Nicholls et al. (2012) recently found that positive emotions resulted in the use of adaptive coping strategies (task-oriented coping strategies like effort expenditure) which in turn had a facilitative effect on self-rated performance, whereas negative emotions resulted in increased use of maladaptive coping strategies (“distraction-” and “disengagement-oriented” coping strategies like distancing or resignation) with detrimental effect on

self-rated performance. However, few studies have examined the emotions and their intensity associated with the stress and coping process and how this might be context dependent (e.g. importance of the competition).

One important limitation of the current stress, coping and emotions literature is that many studies have been conducted on Caucasian athletes with a few exceptions. A study on Korean athletes found an additional coping dimension called “transcendental coping” (Yoo, 2001). Similarly, Laborde, You, Dosseville, and Salinas (2012) found that Chinese table tennis players used more frequently task-oriented and disengagement-oriented coping strategies than their French counterparts. There is also evidence that culture is an important factor in shaping emotions. While the physiological response associated with emotions appears to be invariant, the behavioural expression (facial in particular) varies across cultures (Tsai, Levenson, & Carstensen, 2000). East Asians, for example, are more likely to engage in dialectical thinking believing that positive and negative feelings co-exist (Safdar et al., 2009). Miyamoto, Uchida, and Ellsworth (2010) found that for a positive event (e.g. winning a match), Japanese participants more likely experienced mixed (i.e. positive and negative) emotions, whereas the North American participants mainly experienced positive emotions. East Asians also prefer different positive emotional states compared to North Americans. The former prefer low arousal states like calm and peaceful, whereas the latter prefers high arousal states like excitement and enthusiastic (Tsai, Knutson, & Fung, 2006).

Racial differences have also been shown in response to interventions, psychological preparation and needs or styles of athletes of different cultural backgrounds (Ottley & Volkwein-Caplan, 2004). For example, Anshel (1990) showed that Afro-American athletes perceived sport psychology consultants to be racist and showing a lack of the needs of black athletes. Of the limited research in sport psychology which has examined cultural differences, most have compared white and black athletes.

Considering the possible influence of cultural differences on the stress, coping and emotions process, and the potential differences in responses to interventions and needs of athletes of different cultural and ethnic background, more research is required to examine whether previous literature can be generalised across cultures. Earlier research has mainly focused on black or Caucasian athletes, hence in this study an Asian country was chosen (i.e. elite Malaysian athletes).

The aim of the present exploratory longitudinal diary study was to examine the stressors experienced by Malaysian professional tenpin bowling athletes during important and less important competitions and training (period leading up to the competition). In addition, we examined the coping response, coping effectiveness as well as the emotional response and its intensity.

Method

Participants

Fifteen elite Malaysian tenpin bowlers (male = 6, female = 9) aged 27.67 years \pm 1.84 (male) and 24.67 years \pm 1.40 (female) participated in the study. Participants competed in one minor competition (MIN; Malaysia Open) and two major competitions (MAJ; SEA Games and Asian Championship) in 2011–2012. All participants provided written informed consent and this study was approved by the Research Committee of the National Sport Institute of Malaysia.

Instrument

All bowlers completed diary packs based on the work by Nicholls et al. (2006) and Nicholls and Polman (2007b). The diary consisted of five discrete sections: (1) stressor checklist and

open-ended stressor boxes, (2) open-ended coping response section, (3) perceived coping effectiveness using a Likert-type scale with 1 = *not effective* and 4 = *very effective*, (4) emotion response section (a list of 15 emotions to choose from: anger, guilt, gratitude, envy, shame, compassion, jealousy, relief, happiness, anxiety, hope, pride, fright, sadness and love) and (5) emotion intensity on a Likert-type scale (1 = *not intense* and 10 = *very intense*).

In Section 1, participants were asked to list the stressors in empty boxes that they encountered during training or competition. The stressors were selected from those listed in the stressor checklist which was based on initial interviews with one coach, one coaching director and two bowlers. In addition, two tenpin bowlers pilot-tested the diary during a competition (three days leading up to the competition and seven days of the competition). Section 2 consisted of an open-ended format where participants were asked to “write down what you did to manage each stressor”. Participants were then asked to “rate the effectiveness of each strategy in reducing stress you experienced” on a 4-point Likert-type scale in Section 3. Subsequently participants were asked to report the emotional response from a list of 15 emotions (Section 4) and rated the intensity of the emotion in Section 5.

Context for the current study

With over 100 million participants and 10 million registered competitive players across 90 different countries, tenpin bowling is one of the most popular participation sports (Razman, Cheong, Wan Abas, & Abu Osman, 2012). In 1988, tenpin bowling was a demonstration sport during the Seoul Olympics, and it has been included as a medal sport in the Commonwealth games (1998), Pan American Games (1991) and Asian games (1978). Moreover, professional tournaments now have prize money in excess of a million dollars and worldwide television exposure (www.Bowl.com). Tenpin bowling is a popular sport in Malaysia with the women ranged 9th and the men 17th in the all-time world championship medal table. In addition, in 2003, the World Tenpin Bowling Championship took place in Kuala Lumpur, Malaysia.

Malaysia high performance sport distinguishes major and minor tournaments for tenpin bowlers to participate in. Minor competitions are generally referred to as open tournaments (e.g. Singapore Open, Hong Kong Open, and Malaysian Open), whereas major tournaments are championships (Asian Championship, World Championship, South East Asia Games, and Asian Games). The participants in this study are all professional tenpin bowlers and their continued support by the Malaysian government was performance based.

Procedure

The first author, a sport psychology practitioner who worked closely with the Malaysian tenpin bowling team, contacted participants via the Malaysia Tenpin Bowling Congress to explain the nature of the study. The team manager and the chief coach agreed to participate with condition not to disrupt the bowlers’ training and competition schedules. The first author worked closely with the team during pre-competition training and during competitions. Data were collected during the lead-up to the competition (PRE) and during the competition (COMP). Tenpin bowling competitions consist of a qualifying and stepladder (final) stage. This means that the competition takes place over 7–10 days period. Each data collection period lasted approximately 17 days.

Diary packs (attached with an emotion list) were administered by the first author on different days in multiple booklets based on pre-competition and competitive phases to minimise disruption to the athlete’s routines. The tenpin bowlers were provided with a verbal explanation of the meaning of a stressor in the context of tenpin bowling. This was done in the context of the

stressors obtained from the pilot study. Participants were provided with an example of each of the categories. For example, with regard to physical error, this included ball release too early and for mental error decided to bowl at wrong arrow. The first author reminded the bowlers about the diary pack daily to enhance compliance rate. All bowlers agreed that the best time to complete the diary pack was right after training session during the days leading up to the competition, and between 20.00–23.00 every night during the competition phase. Despite some difficulty faced during the Malaysia Open (MIN) which resulted in incomplete diary packs, overall compliance was high (83.3% return rate). A 100% return rate was achieved for the SEA Games and Asian Championship (MAJ).

Data analyses

Frequencies from the stressors (Section 1) on the checklists were calculated for the pre-competition/training (PRE) and competition (COMP) phases. In addition, they were calculated separately for the major competition (MAJ; average for the two events) and the minor competition (MIN; one event). Written data in the open-ended coping response (Section 2) were transcribed verbatim and subjected to an inductive content analysis procedure (Maykut & Morehouse, 1994).

Similar coping strategies were grouped together as first-order themes and assigned a descriptive label. A rule of inclusion was written for each theme. Similarly, first-order themes were grouped under more abstract labels as second-order themes (e.g. “sit down and drink water” was coded in the second-order themes as “drink water to relax”). The frequency of each coping theme was summed for the whole sample during training and competitions (PRE vs. COMP and MAJ vs. MIN) according to their respective coping dimensions (PFC, EFC and AVC). The coping effectiveness of each strategy (Section 3) in relation to training and competitions were calculated and then divided by the frequency of coping dimension reported. This generated a mean coping effectiveness score for each coping dimension in relation to PRE and COMP days and MIN and MAJ competitions. Emotions were grouped as either positive or negative and their frequency was calculated with respect to their occurrence for each coping dimension. The intensity of each emotion in relation to the coping dimensions was summed and divided by the number of observations.

Chi-square analyses were employed to explore differences between coping dimensions reported during PRE and COMP phases during MAJ and MIN competitions and overall differences between PRE and COMP. *Post hoc* comparisons were conducted by inspecting the standard residuals. One-way analysis of variance (ANOVA) and independent *t*-test were conducted to explore differences between self-reported coping effectiveness and emotional intensity during PRE and COMP phases and MIN and MAJ competitions. In the instance of a significant difference *post hoc* comparisons, using Sidak, were computed. The level of significance was set at $p < .05$.

Results

Stressors

Table 1 provides an overview of the stressors experienced (frequency and percentage) during the PRE and COMP periods and between the MAJ and MIN competitions. A small number of stressors ($n = 5$; pain/injury, physical error, mental error, opponent play well and external condition) accounted for the majority of stressors experienced by the professional tenpin bowlers during the diary period (PRE-MIN 94.2%; COMP-MIN 96.6%; PRE-MAJ 94.7%; COMP-MAJ 95%). The number of stressors reported per bowler during the PRE period of the MIN competition

Table 1. Overview of the frequency and percentage (%) of stressors experienced during the PRE and COMP periods and MIN and MAJ competitions.

Stressor	MIN		MAJ	
	PRE (<i>n</i> = 140) <i>m</i> = 3.68/day	COMP (<i>n</i> = 208) <i>m</i> = 3.41/day	PRE (<i>n</i> = 173) <i>m</i> = 2.25/day	COMP (<i>n</i> = 181) <i>m</i> = 2.62/day
Pain/injury	30 (21.4%)	43 (20.7%)	57 (32.9%)	47 (26.0%)
Physical error	52 (37.1%)	71 (34.1%)	62 (35.8%)	69 (38.1%)
Mental error	28 (20.0%)	27 (13.0%)	24 (13.9%)	22 (12.2%)
Being criticised	6 (4.3%)	4 (1.9%)	9 (5.2%)	11 (6.1%)
Opponent cheat	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)
Opponent play well	8 (5.7%)	34 (16.3%)	9 (5.2%)	14 (7.7%)
External condition	14 (10.0%)	26 (12.5%)	12 (6.9%)	18 (10.0%)
Received wrong call	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)
Distraction	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)
Loss of focus	2 (1.4%)	0 (0%)	0 (0%)	0 (0%)

was 2.53 which was significantly less than the 5.12 during the MAJ competition ($\chi^2(1) = 87.7$; $p < .001$). However, the average number of stressors reported per bowler during the MIN and MAJ competitions did not differ (4.06 vs. 4.61; $\chi^2(1) = 3.49$; $p = .06$). Overall significantly more stressors were reported during competition (average of 4.3 per bowler per day) in comparison to the pre-competition training periods (average of 3.52 per bowler per day) ($\chi^2(1) = 7.78$; $p = .005$).

Coping

Table 2 shows the comparison of coping dimensions and effectiveness between MIN and MAJ competitions for the PRE and COMP phases by stressor. Table 2 also provides the results of the chi-square analysis for differences in use of coping dimension between MIN and MAJ during the PRE and COMP phases for each stressor.

The chi-square analysis comparing differences in coping between the PRE and COMP conditions was significant ($\chi^2(2) = 6.04$; $p = .049$; Cramer's $V = .14$). However, inspection of the standard residuals did not indicate that one coping dimension was over/under-represented in comparisons to what was expected.

Significant differences were observed for physical error, mental error and total when comparing the PRE phase of the MIN with the MAJ competitions (Table 2). The standard residuals indicated that for physical error during the MIN competition, the bowlers used more EFC ($Z = 2.2$; $p < .05$) and less PFC ($Z = -2.0$; $p < .05$), whereas the reverse was the case in MAJ competitions. For mental error, the residuals indicated that during the MIN competition the bowlers used less AVC ($Z = -2.2$; $p < .05$) compared to PRE of MAJ competitions. For total, the residuals showed more use of EFC during the PRE of the MIN competition ($Z = 1.9$; $p < .05$) compared to PRE of the MAJ competitions.

Significant differences were also observed for physical error, mental error, external condition and opponent play well when comparing the COMP phase of the MIN with the MAJ competitions. *Post hoc* testing showed no significant difference for external condition or opponent play well. For physical error the standard residuals indicated that the bowlers used more PFC during the MIN competition ($Z = 1.9$; $p < .05$) and less PFC during the MAJ competitions. Finally, for mental error the standard residuals indicated that the bowlers used more EFC ($Z = 2.4$; $p < .05$) and less AVC ($Z = -2.4$; $p < .05$) during the MIN competition compared to MAJ competition ($Z = 2.4$; $p < .05$).

Table 2. Absolute frequency and percentage (%) of reported coping strategies and mean scores for coping effectiveness during MIN and MAJ competitions and during PRE and COMP phases by coping dimensions for the five main stressors.

Stressor	MIN						MAJ						Chi square	
	PRE			COMP			PRE			COMP			PRE	COMP
	PFC	EFC	AVC	PFC	EFC	AVC	PFC	EFC	AVC	PFC	EFC	AVC	$\chi^2(2)$	$\chi^2(2)$
Pain/injury	22	3	5	25	7	11	40	2	15	25	6	16	4.5	1.6
	73.3%	10%	16.7%	58.1%	16.3%	25.6%	70.2%	3.5%	26.3%	53.2%	12.8%	34%	0.15	0.09
Physical error	3.6	3.7	3.4	3.4	2.9	3.7	3.2	3.0	3.1	3.4	3.0	2.9	18.4**	8.5**
	17	26	9	36	24	11	38	14	10	21	32	16	0.30	0.21
Mental error	3.2	3.0	3.0	2.9	2.7	3.1	3.2	3.1	2.8	3.4	2.9	3.0	14.9**	25.5**
	13	11	4	9	16	2	9	6	9	10	6	6	0.27	0.36
External condition	3.4	3.1	3.0	3.0	3.0	3.5	2.9	3.1	3.0	2.6	2.8	2.6	–	6.3*
	9	5	0	13	9	4	6	3	3	6	9	3	–	0.17
Opponent play well	2.6	3.4	–	3.0	3.0	2.3	3.0	2.7	3.0	2.9	2.8	3.0	–	9.6**
	7	1	0	22	6	6	9	0	0	6	4	4	–	0.22
Others	3.6	2.0	–	3.1	3.2	3.5	2.8	–	–	3.3	2.6	3.0	–	–
	1	8	0	2	4	1	6	2	1	4	5	2	–	–
Total	11.1%	88.9%	0%	28.6%	57.1%	14.3%	66.7%	22.2%	11.1%	36.4%	45.5%	18.1%	10.8**	3.5
	3.5	2.0	–	3.0	3.0	3.5	2.7	3.5	3.0	3.1	3.3	3.0	0.23	13.2
	69	53	18	107	66	35	108	27	38	72	62	47		
	49.3%	37.9%	12.8%	51.5%	31.7%	16.8%	62.4%	15.6%	22.0%	39.8%	34.3%	25.9%		
	3.2	2.9	3.1	3.1	2.9	3.3	3.1	3.0	3.0	3.2	2.9	2.9		

Note: The results of the chi-square comparison between the PRE and COMP phases between the MIN and MAJ competitions and the effect size (Cramer's V) are included.

* $p < .05$.

** $p < .01$.

Coping effectiveness

Data analyses on coping effectiveness between the three higher order coping dimensions (independent of the importance of the competition or phase) showed a significant effect ($F(2, 719) = 8.16$; $p < .001$; $\eta^2 = .02$). *Post hoc* comparisons showed that EFC was rated with lower levels of coping effectiveness ($M = 2.92$) compared to PFC ($M = 3.15$; $p < .01$) and AVC ($M = 3.06$; $p = .05$). Secondly, we found the effectiveness for the three higher order coping dimensions varied across MIN and MAJ competitions and across PRE and COMP phases. The one-way ANOVA's for PFC ($F(2, 370) = 1.15$; $p = .32$; $\eta^2 = .01$), EFC ($F(2, 206) = 0.42$; $p = .74$; $\eta^2 = .01$) and AVC ($F(2, 134) = 2.46$; $p = .07$; $\eta^2 = .05$) did not show any significant differences.

Data analyses showed that coping effectiveness of PFC, EFC and AVC varied across MIN and MAJ competitions and PRE and COMP phases based on stressor type. For pain/injury significant effects were found for EFC ($F(3, 14) = 4.35$; $p = .02$; $\eta^2 = .48$) and AVC ($F(3, 43) = 4.63$; $p = .007$; $\eta^2 = .24$). *Post hoc* comparisons showed that for EFC the bowlers reported higher coping effectiveness for the MIN PRE compared to all other conditions. For AVC, coping effectiveness was reported to be higher during MIN COMP in comparison to MAJ PRE and MAJ COMP. There was also a significant effect for PFC for the mental error stressor ($F(3, 37) = 4.45$; $p = .009$; $\eta^2 = .27$). *Post hoc* comparisons showed that during MIN PRE self-reported ratings of coping effectiveness was significantly higher in comparison to MAJ COMP ($p = .001$). No differences were found for the stressors physical error, external condition or opponent play well.

Emotions

Table 3 provides an overview of the positive and negative emotions experienced during the PRE and COMP phases of the MIN and MAJ competitions. In addition, it provides information on the emotional intensity experienced and results of the chi-square analysis. There were no significant differences between the number of positive and negative emotions experienced between the PRE and COMP phases ($\chi^2(2) = 2.7$; $p = .10$; Cramer's $V = .12$).

The statistical analysis for the PRE phase between the MIN and MAJ competitions only revealed a significant difference for the total score. Examination of the standardised residuals indicated that during the MIN competition the bowlers experienced more positive ($Z = 2.8$; $p < .01$) and less negative emotions ($Z = -3.1$; $p < .01$) compared to the PRE phase of the MAJ competition.

The statistical analysis for the COMP phase found significant difference for the stressor pain/injury and external conditions. The standard residuals showed more positive emotions ($Z = 1.9$; $p < .05$) and less negative emotions ($Z = -3.1$; $p < .01$) during the MIN competition than during the MAJ competition. Similarly for external condition the bowlers reported experiencing more positive ($Z = 3.4$; $p < .01$) and less negative ($Z = -4.9$; $p < .01$) emotions during the MIN competition than during the MAJ competitions.

Emotion intensity

Independent *t*-test showed that positive emotions were experienced with higher intensity ($M = 7.32$) when compared to negative emotions ($M = 6.87$) ($t(781) = 4.57$; $p < .001$; Cohen's $d = 0.34$). Also, one-way ANOVA showed that there was an overall effect for condition on emotional intensity for both positive ($F(3, 493) = 13.36$; $p < .001$; $\eta^2 = .08$) and negative ($F(3, 282) = 18.77$; $p < .001$; $\eta^2 = .17$) emotions. For positive emotions *post hoc* comparisons showed that MIN PRE was significantly lower than the other three conditions (all $p < .001$). For negative emotions MIN

Table 3. Absolute frequency and percentage (%) of reported emotions and emotion intensity (mean score) during the PRE phase between MIN and MAJ competitions by coping dimensions for the five stressors.

Stressor	MIN				MAJ				Chi square	
	PRE		COMP		PRE		COMP		PRE	COMP
	Positive <i>m</i> = 3.11/day	Negative <i>m</i> = 1.00/day	Positive <i>m</i> = 2.74/day	Negative <i>m</i> = 1.46/day	Positive <i>m</i> = 1.57/day	Negative <i>m</i> = 0.78/day	Positive <i>m</i> = 1.45/day	Negative <i>m</i> = 1.32/day	$\chi^2(2)$	$\chi^2(2)$
Pain/injury	38	0	68	8	29	31	27	20	–	26.4**
	100%	0%	89.5%	10.5%	48.3%	51.7%	57.4%	42.6%		0.36
Physical error	7.6	–	7.9	9.0	7.6	6.2	7.2	6.3	0.01	0.08
	42	16	40	41	49	19	39	38	0.00	0.02
Mental error	72.4%	27.6%	49.4%	50.6%	72.1%	27.9%	50.6%	49.4%		
	6.0	7.0	7.4	7.5	7.9	6.6	7.6	6.6	1.5	2.6
External condition	22	8	13	17	13	7	12	10	0.09	0.12
	73.2%	26.8%	43.3%	56.7%	65%	35%	54.5%	45.5%		
Opponent play well	6.5	6.5	7.1	7.1	6.8	5.8	6.6	6.5	0.12	72.1**
	11	3	22	9	10	3	8	12	0.02	0.60
Others	78.6%	21.4%	95.7%	4.3%	76.9%	23.1%	40%	60%		
	7.0	5.3	7.5	8.4	6.2	5.0	7.2	7.3	–	0.32
Total	3	5	19	20	11	0	8	7	–	0.04
	37.5%	62.5%	48.7%	51.3%	100%	0%	53.3%	46.7%		
Total	4.7	7.4	7.8	7.2	7.1	–	7.7	7.0	–	2.7
	2	6	5	2	–	–	6	4	–	0.12
Total	25%	75%	71.4%	28.6%	–	–	60%	40%		
	7.5	6.3	8.0	7.5	–	–	7.7	6.5		
Total	118	38	167	97	121	60	100	91	35.4**	3.5
	75.6%	24.4%	65.2%	34.8%	66.9%	33.1%	52.4%	47.6%	0.42	0.13
	6.7	6.7	7.7	7.6	7.5	6.2	7.4	6.6		

p* < .05.*p* < .01.

PRE condition was rated with significantly higher intensity than the other three conditions (all $p < .001$) (Table 3).

Emotional intensity varied between the PRE and COMP phases and MIN and MAJ competitions for each stressor. There was a significant difference for the stressor pain/injury for both positive ($F(3, 158) = 3.06$; $p = .03$; $\eta^2 = .06$) and negative ($F(2, 56) = 29.74$; $p < .001$; $\eta^2 = .52$) emotions. The tenpin bowlers reported higher positive emotional intensity for MIN COMP compared to MAJ COMP ($p = .003$). Also, they reported higher negative emotional intensity for MIN COMP compared to MAJ COMP ($p < .001$) and MAJ PRE ($p < .001$). There was also a significant effect for positive ($F(3, 66) = 19.37$; $p < .001$; $\eta^2 = .26$) and negative ($F(3, 110) = 4.39$; $p = .006$; $\eta^2 = .11$) emotions for the stressor physical error. *Post hoc* comparisons revealed that for positive emotions during MIN PRE the bowlers reported significantly lower positive emotional intensity compared with the other three conditions (all $p < .001$). For the MIN COMP the bowlers reported significantly higher negative emotional intensity compared to MAJ PRE ($p = .009$) and MAJ COMP ($p = .001$). For the stressor external conditions there was only a significant effect for positive emotions ($F(3, 47) = 3.76$; $p = .02$; $\eta^2 = .19$). The MAJ PRE conditions had significant lower positive emotional intensity compared to MIN COMP ($p = .002$) and MAJ COMP ($p = .047$).

Discussion

This study examined the differences in the stressors experienced, coping, coping effectiveness and emotional reactions prior to and during minor and major competitions among tenpin bowlers. Overall, the results indicated that the types of stressors experienced by the athletes are similar to those reported in previous studies. Tenpin bowlers reported more stressors during competition in comparison to the pre-competition training phase regardless of the importance of the competition. No overall differences in coping were observed between PRE and COMP phases or between MIN and MAJ competitions although EFC was rated as less effective in comparison to PFC and AVC. Also, differences were observed in both coping and coping effectiveness when examining these at the stressor level. Finally, for the PRE phase more positive emotions were experienced during the MIN in comparison to the MAJ competitions but no differences were found for the individual stressors. For the COMP phase on the other hand, there were differences for the stressor pain/injury and external condition. Also, emotional intensity was influenced by context, importance of the competition and stressor type.

Stressors

The nature and number of stressors reported by the tenpin bowlers were similar to those described in previous studies (e.g. Gan, Anshel & Kim, 2009; Nicholls, Polman, Levy, Taylor, & Colbey, 2007). Five stressors in the current study accounted for approximately 95% of the stressors experienced over the diary periods. Similar results have been reported in studies with elite Rugby Union athletes (Nicholls et al., 2006; Nicholls & Polman, 2007b) and golfers (Nicholls et al., 2005). In these studies, athletes also reported only a limited number (four/five) of stressors reoccurring over time. There is variation in the type of reoccurring stressors and this appears to be related to the nature of the sport (e.g. injury in Rugby Union and the weather in golf). For the tenpin bowlers, pain/injury and external conditions were typical bowling-related stressors, whereas physical error, mental error and opponent play well appear to be independent of the type of sport or culture.

The type of stressors does not vary across PRE and COMP phases or between MIN and MAJ competitions. In addition, although in absolute term more stressors were reported during the MIN

competition in comparison to the MAJ competitions, this was due to a longer pre-period and the bowlers being in the competition for longer. However, the tenpin bowlers experienced a greater frequency of stressors during COMP compared to the PRE phase. This is in contrast to a study on cross-country runners who experienced more stressors during training than competition (Nicholls, Levy et al., 2009). This might be due to changes in lane conditions (e.g. different oiling patterns) and the notion they have experienced quality opposition. In addition, cross-country runners spend more time in training when compared to competing, whereas tenpin bowlers spend relatively more time competing. As such it is important for future research to consider the relative number of stressors experienced based on the time spent in training or competition.

The tenpin bowlers reported on average more stressors during the MIN when compared to the MAJ competition. Although not a specific aim of their study Nicholls et al. (2005) found that golfers reported more stressors during more important competitions. A possible explanation for this discrepancy might be that the tenpin bowlers were able to win more of their bouts and stayed in the competition for longer in the MIN when compared to the MAJ competitions. The further bowlers progressed in a competition the higher the likelihood they will experience more stressors.

Our findings suggest that tenpin bowlers experience a significant number of stressors during both training and competition. Variation in the nature of the stressor and its frequency appears to be mainly a function of sport-related factors and not ethnicity. It is therefore important for individuals working with athletes to have a good understanding of the typical stressors experienced by athletes and to develop interventions which allow athletes to deal with stressors during both training and competition.

Coping

Differences in coping for the different phases or importance were only observed at the stressor level thereby only partly supporting previous findings (e.g. Nicholls et al., 2005; Nicholls, Levy, et al., 2009). Overall, tenpin bowlers used more EFC in the PRE phase prior to the MIN competition and less EFC prior to the MAJ competitions. To cope with stressors, for physical and mental errors during the PRE phase tenpin bowlers used less PFC and AVC before the MIN competitions, whereas for physical error the bowlers used more PFC in the MIN competition and less PFC in the MAJ competitions. Finally, the bowlers used more EFC and less AVC during the MIN competition and less EFC and more AVC during the MAJ competitions. This pattern of coping makes sense when considering that during MAJ competitions it is more important to regulate the emotional state and ignore errors and solve these at a later date (Nicholls et al., 2007).

The overall use of PFC, EFC and AVC by the tenpin bowlers was almost identical to a study on cross-country runners which assessed coping during training and competition (Nicholls, Levy et al., 2009). The main difference between the two studies was during the MAJ competition in which the tenpin bowlers used more AVC and less PFC when compared to the runners. Findings are not in agreement with Laborde et al. (2012) who found that Chinese table tennis players used more PFC and AVC than the French players. This suggests that differences in coping are more likely the result of the importance of the context (importance of the competition) and the stressor experienced rather than cultural or ethnic differences.

Coping effectiveness

EFC was rated as less effective compared to PFC and AVC. EFC strategies might assist in down-regulation of the emotional state but not necessarily solve the underlying problem and as such is regarded less effective. PFC strategies, on the other hand, assist the athlete in solving the problem

and are often associated with better performance outcomes (e.g. Nicholls et al., 2012). In a study on soccer players, Jordet and Elferink-Gemser (2011) reported that AVC strategies (i.e. looking away and pretending to be normal) can be effective in dealing with the problem in the short term. However, AVC only provides temporary relief from the stressor and a problem-focused strategy is normally required to solve the problem (Polman, 2012).

Differences in coping effectiveness were only observed at the stressor level. When experiencing pain/injury the tenpin bowlers rated EFC as more effective during the PRE phase of the MIN competition, whereas AVC was more effective during the minor competition. For mental error, the tenpin bowlers reported that PFC was more effective during the PRE phase of the MIN competition compared to MAJ COMP. This would suggest that the bowlers are more likely to solve mental errors prior to minor competitions than major competitions. It is likely that they prefer to continue with their routine prior to these major events without attempts to change possible mental problems.

For the athlete, coach and/or sport psychologist, it is important to regularly examine which coping strategies work best in relation to specific stressors and context. Ultimately, this might help the athlete to implement the most effective coping strategy depending on situational and contextual factors thereby optimising performance.

Emotions

No study has examined cultural differences in emotions in the sporting context. Nicholls, Jones et al. (2009) found that Caucasian and Fijian Rugby Union athletes experienced more negative emotions, whereas the Malaysian tenpin bowlers in the present study experienced a similar number of positive and negative emotions independent of the phase or importance of the competition. Our finding supports the idea that positive and negative emotions are independent yet can co-exist in the sport context (Nicholls et al., 2010). In addition, it provides support for the notion that East Asians experience mixed emotions (Miyamoto et al., 2010) and are more likely to engage in dialectical thinking, believing that positive and negative feelings can be experienced concurrently (Safdar et al., 2009).

There also appears a difference in the type of emotions experienced by the Malaysian tenpin bowlers and the Rugby Union athletes in the Nicholls, Jones, et al., 2009 study. The tenpin bowlers reported mainly anger (19% of the total emotions reported) and sadness (18%) as the negative and hope (25%) and relief (16%) as the positive emotions, whereas the Rugby Union athletes reported anxiety (44%) and anger (42%) as the negative and pride (6%) and hope (4.2%) as the positive emotions. The positive emotions reported by the tenpin bowlers appear to support the notion that East Asians prefer low arousal positive emotion (Tsai et al., 2006) at least in the sport of tenpin bowling.

Our results showed that the importance of the competition shaped the emotional response of the tenpin bowlers for the individual stressors. During the PRE phase the tenpin bowlers reported experiencing more positive and less negative emotions during the MIN competition, whereas this was reversed in the MAJ competitions. For the COMP phase there were differences between MIN and MAJ competitions for the stressors pain/injury and external conditions. In both instances, the bowlers reported experiencing more positive and less negative emotions during MIN COMP and less positive and more negative emotions during MAJ COMP. This would suggest that event importance can shape emotional responses with more negative emotions being reported during more important and more positive during less important competitions (Nicholls et al., 2010).

Our findings suggest potential differences in emotions between Caucasian and Asian athletes. Although future studies would require to compare athletes of different cultural backgrounds within the same sport as well how positive and negative emotions influence performance and

the possible moderating role of the cultural background of athletes. In addition, there might be different display rules in sport in the appropriateness in expressing certain emotions in a given situation across cultures. This is an issue which needs to be validated in future research.

Emotion intensity

The tenpin bowlers reported higher levels of emotional intensity for positive emotion compared to negative emotions. The average intensity for the positive and negative emotions was of similar magnitude reported by the Rugby Union athletes in the Nicholls, Jones et al., 2009. study. In addition, during the PRE phase of the MIN competition, the athletes reported lower positive and higher negative emotional intensity. These differences in emotional intensity might be due to differences in coping. This is supported by some of the variation in coping and coping effectiveness. However, it is clear that the type of stressor might also influence the emotional response during the different conditions. In addition, the present study did not examine the intensity of the stressors. Higher levels of stress intensity are likely to influence the emotion experienced and its intensity although coping will mediate this relationship (Nicholls et al., 2012).

Our results suggest that the stressor type and frequency, coping and coping effectiveness are similar in the Malaysian tenpin bowlers in comparisons to previous results reported on mainly Caucasian athletes. The type of sport, importance of the competition and phase (i.e. training vs. competition) appear to be more important factors influencing the stress and coping process. However, differences are apparent in the emotional responses. The Malaysian athletes in this study experienced a mixture of emotions which appear qualitatively different from Caucasian athletes. Future research is required to further examine the differences and similarities in emotions in athletes from different ethnic backgrounds. For example, Tsai et al. (2006) found that East Asian's prefer different positive emotional states when compared to North Americans (calm/peaceful vs. excited/enthusiastic). These different preferences at pre-performance states might influence stress appraisals and emotional reactions.

The differences in emotions between athletes from different cultural backgrounds also have implications for applied practitioners. Asian athletes also require interventions for both practice and competition. However, it appears that the Malaysian athletes require less regulation of (pre-performance) anxiety, a major focus of many intervention programmes. In contrast, they might need intervention programmes which can deal with both the negative and positive emotions in a productive way. In addition, if East Asians prefer more calm/peaceful pre-performance state, then emotional regulation strategies might be more related to relaxation than increasing arousal (Tsai & Park, 2014). Ultimately, cultural misunderstandings need to be avoided and we need to assist coaches and sport psychologist to help their athletes to achieve optimal performance and satisfaction.

This research is not without limitations. All data were self-reported and although we decreased the time between the stress and coping event data are likely to be influenced by retrospective bias. Although we pilot-tested the diary extensively prior to using in this study, there is also a possibility that the method used is not the most appropriate for the population under investigation. Finally, we used a homogenous sample of professional tenpin bowlers limiting the generalisability to other sports.

In conclusion, our research demonstrates that athletes experience only a limited number of stressors over time, but that the way they cope with these stressors is influenced by the context and importance of an event rather than cultural differences. Our study presented a novel finding whereby the stressors and coping behaviour of the Malaysian tenpin bowlers was similar to that reported in previous studies but their emotional response appeared to vary. There is an urgent need to further examine cultural similarities and differences in the stress,

coping and emotions process in athletes. This is important from both a theoretical and a practical perspective. Hence, this will prevent misunderstanding and miscommunication and allow for interventions which are not only situation and context specific but also culturally sensitive.

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