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Examining the big three of coping in adolescent athletes using network analysis

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EXAMINANDO LOS TRES GRANDES COMPONENTES DEL PROCESO DE AFRONTAMIENTO EN ATLETAS ADOLESCENTES UTILIZANDO *NETWORK ANALYSIS*

KEYWORDS: Appraisal, emotion, coping, adolescent athletes; network analysis.

ABSTRACT: The study of the big three of coping (i.e., appraisals, emotions, and coping strategies) from factorial approach has been somewhat problematic in sport research. In this study, we had the aim to examine the relationships among the components of big three of coping using network analysis as an alternative approach to factorial approach. Using cognitive-motivational-relational theory as framework, we assessed appraisals, emotions and coping strategies in a sample of 276 synchronized swimming athletes (M = 14.63; SD = 2.01). Results present a network analysis of polychoric correlations among variables, showing three main groups of interrelations: (a) goal withdrawal zone include dejection, anger, venting of unpleasant emotions, disengagement, mental distraction, and social withdrawal; (b) mastery zone include primary and secondary appraisals, excitement, happiness, effort expenditure, mental imagery, and some thought control items; and (c) internal regulation zone include anxiety, logical analysis, some items of thought control, relaxation, and seeking social support. Results are congruent with Nicholls, Taylor, Carrol and Perry (2016) coping classifications; and show similarities with previous literature regarding the relations between appraisals, emotions, and coping.

Participating in sport is a potentially stressful experience for adolescent athletes (Tamminen and Holt, 2010). According to cognitive-motivational-relational-theory (CMRT, from Lazarus, 1991, 1999), stress occurs when an athlete interprets that a certain situation endangers his/her personal goals or has the potential to do so. This theory postulates that stress management involves a dynamic process among three variables that we named "the big three of coping". This group is constituted by stress appraisals, emotions, and coping strategies. According to this approach, individuals appraise situations in regard to their implications to their personal goals, beliefs, or values. Appraisals generate certain emotions, which the individual will have to cope with. Additionally, the coping process will generate new appraisals and re-appraisals, restarting this recursive process. In sport, the interrelations among components of the big three of coping have been tested both from a qualitative and quantitative perspectives (Nicholls and Polman, 2007). In this study, we aim to address some problems that have previously risen in sport research regarding the evaluation of the big three of coping from a quantitative approach.

Evidence exist that all components of the big three of coping show difficulties when treated as factors (Perry, Nicholls, Clough, and Crust, 2015). These problems are specially recurrent with coping strategies (Gaudreau et al., 2015; Nicholls, Morley and Perry, 2015; Nicholls, Perry and Calmeiro, 2014). Therefore, empirical attempts to conduct factorial measurement models for coping strategies have led to use psychometrically questionable strategies (Marsh, Lüdtke, Nagengast, Morin, and Von Davier, 2013; Yu, 2002), such as accepting goodness of fit indices lower than those established by standards (Nicholls et

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al., 2015), or item parcelling (Gaudreau et al., 2015; Nicholls et al., 2014).

The reason why factorial approach usually fails for coping might relate with coping measurement, as coping instruments usually measure specific behaviours used by athletes to cope with the competition. We believe that coping behaviours of a same family might not be necessarily independent. Factorial approach assumes null correlation among residuals of different observed indicators (i.e., local independence; Wright, 1921). In this study, we suggest network analysis as an alternative to factorial approach (Epskamp, Rhemtulla and Borsboom, 2017). Networks are graphical analyses of the interactions between variables presented as a set of nodes connected by edges. In this study, we aim to examine the interrelations among the components of big three of coping using network analysis in a sample of adolescent athletes.

Method

Participants

In this study participated 276 adolescent athletes between 12 and 21 years old (M = 14.63; SD = 2.01) that practiced synchronized swimming (n = 152; 55.1%), basketball (n = 65; 23.5%), and judo (n = 59; 21.4%). Females composed a 70.1% of the sample.

Measures

Appraisals were assessed using the Precompetitive Appraisal Measure (Wolf, Evans, Laborde and Kleinert, 2014). This is a six-item questionnaire beginning with the stem "The upcoming competition…" The questionnaire assesses primary appraisal (e.g., "is important to me") and secondary appraisal (e.g., "is likely to result in a positive outcome for me"). All items are on a seven-point Likert-style scale. This instrument has showed adequate model fit in a previous study (Wolf, Eys, Sadler and Kleinert, 2015).

Emotions were assessed using the Sport Emotion Questionnaire (Jones, Lane, Bray, Uphill and Catlin, 2005). This 22-item questionnaire assesses emotions using the following stem "before or during the competition, I feel…" Emotions assessed were anxiety (e.g., "tense"), dejection (e.g., "upset"), anger (e.g., "furious"), excitement (e.g., "enthusiastic"), and happiness (e.g., "joyful"). All items are on a five-point Likert-style scale. This instrument showed undesirable model fit in some studies (Perry et al., 2015).

Coping strategies were assessed through the Coping Inventory for Competitive Sport (Gaudreau and Blondin, 2002). This 39-item questionnaire assesses coping behaviours used by athletes. The questionnaire measures 10 coping strategies (i.e., effort expenditure, logical analysis, thought control, relaxation, mental imagery, seeking social support, venting of unpleasant emotion, disengagement, mental distraction, and social withdrawal), categorized in three high-order coping dimensions (i.e., task-, distraction-, and disengagement-oriented coping.). All items are on a five-point Likert-style scale. This instrument showed undesirable model fit in some studies (Perry et al., 2015).

Procedure

We obtained ethical approval by the ethics committee of local university. After contacting sport clubs interested in participating, we scheduled a date to administer the questionnaires. Before each administration, we explained to all participants the objectives of the investigation, reminded them that they could abandon the investigation at any point, and ensured the confidential nature of the information provided. For data storage, we used an anonymized database in order to ensure the confidentiality. Completion of the questionnaires took approximately 20 minutes. One or two researchers were present at all data collections. The data collection was conducted during the 2014-15 and 2015-16 seasons.

Data analysis

Preparatory data analysis consisted on examining missing data, item distribution and multilevel design effects using "SubscaleExplorer" package for R (Angulo-Brunet and Viladrich, 2017). After this, we used "qgraph" package for R (Epskamp, Cramer, Waldorp, Schmittmann and Borsboom, 2012) for conducting a network analysis of polychoric correlations among items estimated through maximum likelihood.

Results

Preparatory data analysis showed that missing data represented the 6.54% of the data. Additionally, we observed ceiling and floor effects in many items and no multilevel design effects. Given these results, we decided to analyse polychoric correlations between items using the default estimation method in "qgrpah" package, which is robust to missing data.

We conducted a network analysis that shows a graphic display of the polychoric correlation among the items. This network is presented in Figure 1. Results show that items of the same subscale are mostly grouped together. This is clearly observable in most of the 17 subscales, except for the subscales of primary appraisal (purple triangles), social support (red circles), and thought control (dark blue circles). Additionally, some items are displayed far from their subscale in the network. This is the case for "LAN3" (i.e., "I analysed the demands of the competition"), "RES2" (i.e., "I wished that the competition would end immediately"), and "SW3" (i.e.," I searched for calmness and quietness").

As a whole, network analysis is divided into three main sets of relations (see Figure 2). Each set agglutinates one or more emotions and some coping strategies. The first set (solid line) is composed of dejection and anger, along with coping strategies of venting unpleasant emotions, disengagement, mental distraction, and social withdrawal. We named this group the goal withdrawal zone. The second set of variables (dashed line) is composed of primary and secondary appraisals, emotions of excitement and happiness along with effort expenditure, mental imagery, and some but not all, thought control items. We name this set the mastery zone. The third set (dotted line) of relations is mainly composed of positive relations between anxiety, logical analysis, some items of thought control, relaxation, and seeking social support. We name this set the internal regulation zone.

Discussion

This study had the aim to examine the relationships among the components of the big three of coping using network analysis as an alternative to factorial approach. Results show similarities with some sport-specific coping classifications; and similar interrelations among the components of the big three of coping than previous empirical studies in the same line.

Results show a network structure divided into mastery zone, internal regulation zone, and goal withdrawal zone. These zones have been purposefully named using the terms of the classification of coping suggested by Nicholls et al. (2016). According to them, mastery coping refers to those strategies aiming to control the situation and eliminating stressors. Internal regulation coping embraces those efforts to regulate internal stress responses. Finally, goal withdrawal coping comprehend those strategies directed to diminish efforts towards goal attainment. Therefore, this study brings initial support to the classification of coping recently suggested by Nicholls et al. (2016).

This study presents relations within the components of the big three of coping. Appraisals showed to be positive relations with anxiety, excitement, and happiness; and negatively related with dejection and anger. Meanwhile, emotions grouped with different set of coping strategies, being mastery coping strategies correlated with excitement and happiness; internal regulation strategies correlated with anxiety; and goal withdrawal strategies correlated with dejection and anger. These results are congruent with research studying the big three of coping in sport (Doron and Martinent, 2016), suggesting a close interrelation among the three components. Our results also support that different emotions are coped using different coping strategies (Uphill and Jones, 2007). Even so, research suggest that sport demands are also important when athletes select some coping strategies to certain cope with emotions (Lewis, Knight and Mellalieu, 2017).To conclude, this article presents network modelling as a different approach to assess interrelations among the big three coping from a quantitative perspective, trying to find a feasible alternative to factorial approach and problems that rose from it. Our results suggest that coping strategies structure similar to Nicholls's et al (2016) classification, and observed relationships among components of the big three of coping similar to those found in previous studies. This study is first step in showing network modeling as a valid method to assess the big three of coping in sport.

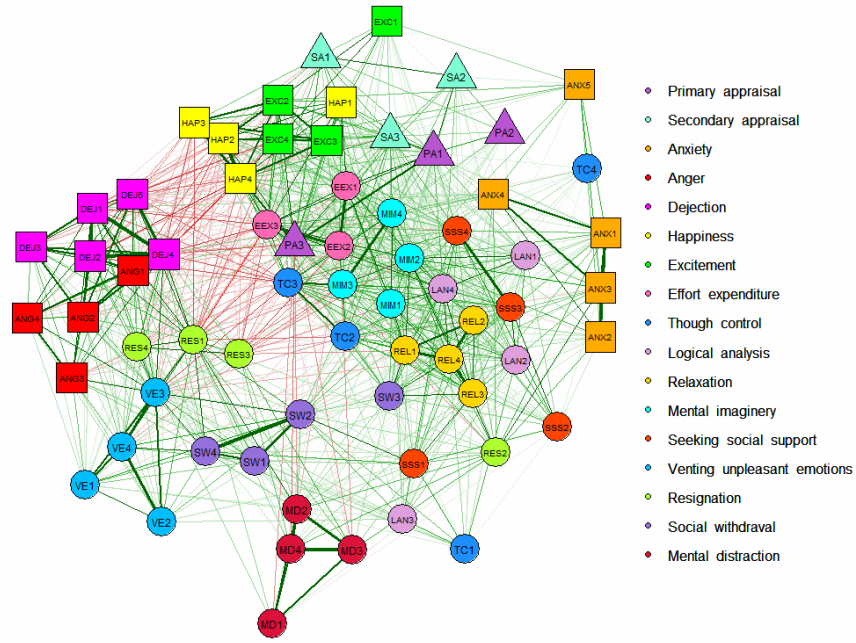

Figure shows correlations greater than .15. Each node represents one item. Green lines represent positive correlations and red lines represent negative correlations. Magnitude of correlations is represented by thickness of each line, where thicker lines correspond to greater magnitude

Figure 1. Network analysis of polychoric correlations among items of appraisals, emotions and coping.

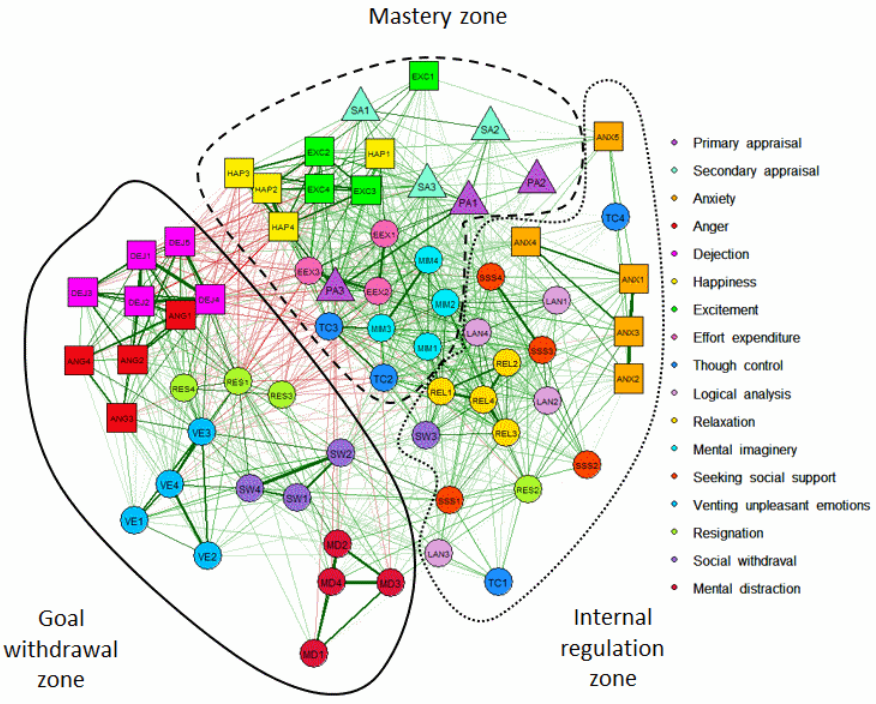

Figure shows correlations greater than .15. Each node represents one item. Green lines represent positive correlations and red lines represent negative correlations. Magnitude of correlations is represented by thickness of each line, where thicker lines correspond to greater magnitude. Solid line referrers to goal withdrawal zone; dashed line refers to mastery zone; and dotted line refers to internal regulation zone.

Figure 2. Network analysis of polychoric correlations among items of appraisals, emotions and coping.

EXAMINANDO LOS TRES GRANDES COMPONENTES DEL PROCESO DE AFRONTAMIENTO EN ATLETAS ADOLESCENTES UTILIZANDO NETWORK ANALYSIS

PALABRAS CLAVE: Valoración cognitiva, emoción, afrontamiento, deportistas adolescentes, *network analysis*.

RESUMEN: En la literatura científica, el estudio de los tres grandes componentes del proceso de afrontamiento (i.e., valoraciones cognitivas, emociones, y estrategias de afrontamiento) desde una perspectiva factorial ha conllevado algunas dificultades. Por ello, este estudio tuvo el objetivo de examinar las relaciones entre los tres componentes del proceso de afrontamiento mediante el *network analysis*, como alternativa a la perspectiva factorial. Partiendo de la teoría cognitivo-motivacional-relacional como marco teórico de referencia, en este estudio evaluamos las valoraciones cognitivas, las emociones y las estrategias de afrontamiento en una muestra de 276 deportistas que practicaban natación sincronizada (M = 14.63; DE = 2.01). Los resultados presentan correlaciones policóricas entre variables mediante un *network analysis*, observándose tres grupos principales de relaciones entre variables: (a) la zona de distanciamiento de los objetivos que incluye las emociones de abatimiento y enfado, junto a las estrategias de salida de emociones desagradables, resignación, distracción mental, y distanciamiento; (b) la zona de maestría, que incluye las valoraciones cognitivas primaria y secundaria, las emociones de excitación y felicidad, y las estrategias de esfuerzo, imaginería mental, y algunos pero no todos los ítems del control de pensamiento; y (c) la zona de la regulación interna, que incluye la ansiedad, y las estrategias de análisis lógico relajación, búsqueda de apoyo, y algunos ítems de control del pensamiento. Los resultados son congruentes con la clasificación del afrontamiento propuesta por Nicholls' et al (2016), y muestra coincidencias con la literatura previa respecto a las relaciones observadas entre valoraciones cognitivas, emociones y estrategias de afrontamiento.

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