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Using Exploratory Structure Equation Modeling to validate a new measure of cohesion in the university classroom setting: The University Group Environment Questionnaire (UGEQ)

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ABSTRACT

Despite evidence that cohesion is a significant determinant of academic outcomes in the university setting, a validated multidimensional measure of cohesion adapted to this context is lacking. The purpose of the present study was to develop and validate a cohesion questionnaire in the university setting based on Carron et al.'s (1985) multidimensional model. After conducting a pilot study and exploratory structural equation modeling analyses, a final 16-item version of the questionnaire was retained. The questionnaire presented strong fit to the data, good internal consistency, and measurement invariance across three different criteria. Findings suggest that researchers can use this questionnaire as a reliable, valid, and theoretically-grounded measure of cohesion in the university setting. Implications of these findings research are discussed.

1. Using ESEM to validate a measure of cohesion in the university classroom: the University Group Environment Questionnaire (UGEQ)

Historically, cohesion has been considered as one of the most critical variables in the study of groups (Carron & Brawley, 2000). During more than 60 years of research on cohesion, the concept has been defined in numerous ways (for a review, see Dion, 2000) and has been studied in various fields (*e.g.*, military, industrial-organizational, sport). In 1992, Dion and Evans proposed that the conceptualization of cohesion developed by Carron, Widmeyer, and Brawley (1985) in the sport domain was "promising as a conceptual and methodological approach with potentially broad applicability to different types of groups" (Dion & Evans, 1992, p. 247). Since then, their conceptualization of cohesion has been applied to a broad range of contexts and to a variety of audiences (Carron, Eys, & Martin, 2012; see below).

Carron, Brawley, and Widmeyer (1998) defined cohesion as "a dynamic process which is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" (p. 213). These authors advanced a multidimensional, theory-driven model of cohesion which distinguishes between individual and group dimensions (*i.e.*, individual attractions *vs.* group integration) of both task and social cohesion (Carron et al., 1985, 1998). Four dimensions were identified: Individual attractions to the group-task (ATG-T) referred to members' feelings about their personal involvement in the group's task aspects; Individual attractions to the group-social (ATG-S) reflected members' feelings about their

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personal involvement in the group's social aspects; Group integration-task (GI-T) indicated members' feelings about the similarity and unification the group possesses in relation to group's task aspects; Group integration-social (GI-S) referred to members' feelings about the similarity and unification of the group as a social unit.

Carron et al. (1985) developed the Group Environment Questionnaire (GEQ) to assess these four dimensions of cohesion. Numerous empirical studies have supported the concurrent, predictive, and factorial validity of the GEQ (see Carron et al., 2012), which has come to be the commonly accepted measure of cohesion in the sport context. Furthermore, this questionnaire and its underlying conceptualization have also been used in many different contexts and/or populations such as military (*e.g.*, Ahronson & Cameron, 2007), musical groups (*e.g.*, Dyce & Cornell, 1996), work teams (*e.g.*, Brockman & Morgan, 2006), exercise classes (*e.g.*, Estabrooks & Carron, 2000), youth sport teams (*e.g.*, Eys, Loughead, Bray, & Carron, 2009), or groups of cancer patients (*e.g.*, Midtgaard, Rorth, Stelter, & Adamsen, 2006). Finally, the GEQ has also been translated and validated in several languages (*e.g.*, Brazilian: Nascimento, Vieira, Rosado, & Serpa, 2012; French: Heuzé & Fontayne, 2002; German: Ohlert, 2012; or Greek: Ntoumanis & Aggelonidis, 2004).

While cohesion has prompted research interest in a wide variety of contexts where people operate within groups, Forrester and Tashchian (2006) noticed that cohesion has received limited attention in the university setting. Although some studies have considered group work of students in relation to academic learning (*e.g.*, cooperative learning, collaborative learning; Hammar Chiriac, 2014) and have supported group work as an important component of undergraduate- and graduate-level courses (Buckenmyer, 2000; Deeter-Schmelz, Kennedy, & Ramsey, 2002) directly affecting both academic achievement and collaborative abilities (*e.g.*, Boyle, 2010, 2011;), they did not focus on cohesion itself. Nevertheless, according to research conducted with business students, cohesion appears to be a relevant factor in student teams' performance (Harrison, Price, Gavin, & Florey, 2002; Mathieu, Kukenberger, D'Innocenzo, & Reilly, 2015; Seethamraju & Borman, 2008). Similarly, cohesion may play a protective role against undergraduate dropout by providing students with social and academic support (Wickens, Forbes, & Tribe, 2006).

In addition to the lack of interest in cohesion, a major concern in the university setting pertains to the conceptualization and measurement of cohesion. Previous authors have highlighted the necessity to adopt a multidimensional approach to the construct distinguishing between social and task cohesion, on the one hand, and group and individual beliefs of group members, on the other hand (Carron & Brawley, 2000; Dion, 2000). Nevertheless, research in the university setting has consistently considered only one or two dimensions of cohesion (*e.g.*, Forrester & Tashchian, 2006; Rapisarda, 2002; Troth, Jordan, & Lawrence, 2012). For instance, Troth et al. (2012) investigated the mediating role of communication competence in the relationship between students' emotional intelligence and their perceptions of cohesion. The authors developed a questionnaire measuring cohesion, but only the social orientation was examined. Moreover, some of their items failed to properly reflect social aspects (*e.g.*, "team members consistently helped each other with the assessment task"). In addition, their items referred solely to members' beliefs related to group aspects (*i.e.*, group integration), failing to collect information on members' perceptions of personal involvement (*i.e.*, individual attractions). In other words, Troth et al.'s (2012) measure of social cohesion rather assessed group integration beliefs of task and social aspects. In another study, Rapisarda (2002) considered a general measure of cohesion when examining the relationship between students' emotional competence and team cohesiveness. This measure, based on Stokes' (1983) work, focused on whether members perceive that the group fulfill their personal needs and objectives (*i.e.*, individual attractions to the group; Carron et al., 1985) and did not clearly separate the social and task aspects of cohesion. As another example, Forrester and Tashchian (2006) used a bi-dimensional measure of cohesion (*i.e.*, social cohesion *vs.* task cohesion) to investigate the relationships between both dimensions of cohesion and team effort, team effectiveness, and team work satisfaction. These authors used the pre-existing scale developed by Carless and De Paola (2000), which merged in the same dimension attractions and integration beliefs. Finally, in a recent study investigating the relationship between cohesion and performance within student teams competing in a business simulation, Mathieu et al. (2015) operationalized cohesion as a bi-dimensional construct (*i.e.*, interpersonal-oriented *vs.* task-oriented), although they referred to Moos' (1980) unidimensional definition of cohesion (*i.e.*, the degree to which a collective feeling of unity and belongingness exists within a group).

To conclude, we agree with Mudrack's assertion (1989) that the majority of research on cohesion in the academic setting is "dominated by confusion, inconsistency, and almost inexcusable sloppiness with regard to defining the construct" (p. 45). Thus, the aim of the present study was to develop and validate an operational measure of cohesion in the university setting based on Carron et al.'s (1985) multidimensional model. As underlined earlier, Carron's multidimensional model of cohesion is potentially applicable across different types of groups (Dion & Evans, 1992) and its operational measure has been adapted to several contexts (Carron et al., 2012). However, the application of the GEQ in different contexts has raised questions about the validity of the conceptual model (*e.g.*, business team, Carless & De Paola, 2000; musicians, Dyce & Cornell, 1996). These concerns prompted Carron and Brawley (2000) to advance some conditions necessary to test the structure of cohesion outside the context of competitive sports. First, scholars should consider if the items in the original GEQ are appropriate for the context under focus. Second, scholars should change the wording of items that contains language, terminology, or a situational reference that do not characterize the group(s) under focus. Third, scholars should conduct a pilot test of the items and delete inappropriate items accordingly. Fourth, "researchers should add new items that are more contextually meaningful or better represent the specific group context insofar as any of the four dimensions in the conceptual model are concerned" (Carron & Brawley, 2000, p. 99). This protocol was followed in the present study.

Another contribution of the present research pertains to the statistical approach used to test the psychometric properties of the new measure of cohesion in the university setting. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) have often been used in past research to develop and validate questionnaires assessing psychosocial concepts. However, if psychological instruments commonly have a well-defined EFA structure, CFA analyses often fail to support their structure (Marsh et al., 2009; Marsh, Lüdtke et al., 2010). This discrepancy comes from the CFA assumption that each item is a perfect indicator of its corresponding dimension (Marsh, Morin, Parker, & Kaur, 2014). Accordingly, instead of CFA analyses relying on unrealistic assumptions