Abstract

Construct Validity Studies of a Group Development Measurement Scale (EDG-D)

by

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BA/BS, University of Coimbra, 2012

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Abstract

The *Integrated Model of Group Development* (MIDG), proposed by Miguez and Lourenço (2001), fits into the hybrid category of group development models (Smith, 2001). The model, includes elements from linear – the progression from dependence towards interdependence – cyclical – the psychodynamic perspective of several influencing energies throughout group's developmental process – and polar models – the unceasing tension between the two subsystems that are part of it. The model places its foundations at two equally important subsystems – socio-affective and task – and conceives group development through the course of four stages: *Structuring*, *Reframing*, *Restructuring* and *Realization*. Each of the subsystems intervenes chiefly in the two earlier or latter stages, respectively, while keeping influential along the way to varying degrees. *Group Development Scale – Sport* (or EDG-D) is a self-response instrument based on the MIDG, built to measure group development on sports teams. EDG-D uses a self-response 7-point Likert-scale and includes 36 items (9 *per* stage) measuring central group processes (e.g., communication, conflict, cohesion, clarity of objectives). The original construct validation studies of N. Pinto (2012) lead to the emergence of a three dimensional scale, contrasting to the four stages initially proposed by MIDG: first and second stages corresponded fittingly; thirds and fourth stages, however, emerged grouped together. The present study further tests the psychometric attributes of the scale with a new sample of 54 sports teams (N = 566). Through confirmatory factor analysis we tested the four-stage model (conceptual model) against the three-stage model (emergent model). The scale proved again to fit a three-stage model better, showing very robust

psychometric qualities. Subsequent analytical procedures, including a measurement of invariance, with the same set of data, collected at two different moments along the sports season, further confirmed ascertained results. The final version comprising 27 items showed to be a valid and reliable group development assessment instrument. The results are convergent with a number of previous studies and are discussed in the group development theory framework.

Keywords: Group development, MIDG, EDG-D, CFA, sports teams, scale

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List of Abbreviations

AST	Adaptive Structuration Theory
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
EDG-D	Escala de Desenvolvimento Grupal – Desporto (Group Development Scale – Sport)
EQF	European Qualifications Framework
FIRO	Fundamental Interpersonal Relationship Orientation
GNR	Guarda Nacional Republicana (National Republican Guard)
IBM	International Business Machines Corporation
IMGD	Integrated Model of Group Development
ISCED	International Standard Classification of Education system
ITDF	Integrated Team-Work Framework
MCAR	Missing Completely At Random
MI	Modification Index
MIDG	Modelo Integrado de Desenvolvimento Grupal (Integrated Model of Group Development)
NNFI	Non-Normed Fit Index
OR	Operating Room
ORT	Operating Room Team
PCA	Principal Component Analysis
PDE	Perceção de Desenvolvimento de Equipas (Team Development Perception)
QDEG	Questionário do Desenvolvimento Grupal (Group Development Questionnaire)
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
SPSS	Statistical Package for the Social Sciences
SRMR	Standardized Root Mean Square Residual
TIP	Time-Interaction-Performance
TLI	Tucker-Lewis Index
UNESCO	United Nations Educational, Scientific and Cultural Organization

Chapter 1: Introduction

Organizations are shifting towards an arena of groups. Over the course of the past few decades, people who were traditionally kept at strongholds of isolated functional units have been increasingly merged together into innovative task-forces whose members now form an entanglement of diversity. As a result, both individual and organic change ensues (Chidambaram & Bostrom, 1996). Change is overwhelming in nature: encouraging group's performance and promoting individual wellness is part of the challenge faced by team-leaders; avoiding dysfunctional out-brakes in group development is another.

After been assigned the status of a distinct level of analysis while still maintaining multiple interactions with other levels, the study of groups has been subjected to the analysis of the influence of the passage of time, as well as the group's self-history (McGrath, Arrow, & Berdahl, 2000). Groups feature a multiplicity of processes occurring within its traditional boundaries, including the “simultaneous operation of multiple temporal processes, with potentially different cadences and cyclic forms” (McGrath et al., 2000, p. 100). Immersed in this complex phenomena is group development, whose ways of functioning are sought after by organizational psychologists as means to uncover the intricacies and full potential of group dynamics. This occurs even more so if we acknowledge groups as one of the most fitted structures to duly respond to the complexities and fast-paced shifting’s that are prominent in today's organizational environment (Ito & Brotheridge, 2008). As groups increasingly are one of contemporary

organizations' most important protagonists, it makes only sense to reinforce the knowledge that's been previously gathered by plunging even deeper into its study.

According to Ito and Brotheridge (2008), past instruments designed to assess group development have been subjected to a scarce number of validation studies. It is of main importance to the field of psychological science to have at its disposal instruments, which are useful and widely validated, as this constitutes an essential prerequisite for lasting and fruitful intervention to be made. As Hair, Black, Babin and Anderson (2010) point out, "a model should not be developed without some underlying theory. Theory is often a primary objective of academic research, but practitioners may develop or propose a set of relationships that are as complex and interrelated as any academically based theory" (p. 620).

This matter constitutes the main purpose of this study: to test, validate and ultimately render capable an instrument devised to assess group development in sports teams – *Group Development Scale – Sport* (EDG-D; N. Pinto, 2012) – based on a specific theoretical framework – the *Integrated Model of Group Development* (MIDG; Miguez & Lourenço, 2001) – on which line of research we are now integrated. As Aycan, Bayazit, Berkman and Boravat (2012, p. 427) highlight, "a reliable, valid and up-to-date" measurement instrument of group development is "necessary to guide research and policy-oriented activities".

Our aim, therefore, is to analyze the psychometric properties of EDG-D and ascertain whether we're facing a suitable and comprehensive instrument aimed at assessing the construct it's geared at – groups' current stage of development, specifically

in sports teams. In order to attain this goal, several methodological and statistical procedures were undergone, namely a comparison of several configurations pertaining to the factorial structure of the instrument, followed by a measurement invariance analysis intended to conclude on whether it would behave as a stable measure over time.

The present text attempts to be comprehensive while at the same time easy to skim through. The various sections are organized in a way that tries to pertain an articulated yet relevant take on the overall procedures and theoretical frameworks involved in the validation of a group development instrument. Through the course of its initial sections, this text delves into the milestone group development research, where it tries to briefly outline the main features regarding some of the most influential models that have been around through the course of the past 70 years. Since the theoretical body abridging group development models and theories is so vast, we start by reviewing a few taxonomies of these sort of models. After this initial examination, we go on into exploring the most relevant theoretical aspects revolving around the model in which we base this study. Through the exploration of its cornerstone characteristics and contributes, we're going to find out that a number of preceding studies already tapped into many aspects regarding the model that warranted some clarification. After these initial two chapters, we try to go in-depth into presenting the intricacies related to the instrument whose validation we're hoping to contribute to. We will review thoroughly all the past contributions, attempts at validation as well as different versions of the scale. At this stage it will become fairly clear we're facing a rather strong instrument in terms of psychometric capabilities, which we're going to try to further ascertain. Then, we'll carry

on into clarifying some of the main methodological aspects grounding our research, as well as some of the research options we took in the course of our work. This is the moment in which we're going to start presenting the results of our study, through the course of which we undertook a series of factor analysis procedures – finishing with a measurement invariance test – while ultimately trying to establish what factorial structure is the most fitting to the data gathered. Finally, almost at the end of this text we bring about the "Discussion" section, in which we try to establish some relevant links between the main findings of our research and the information scattered across the relevant literature. We ultimately close down our text in the "Conclusions" sections, where we try to group together a few ending notes, ideas and remarks.

Chapter 2: Group Development

Beginnings and State-of-the-art

Groups are an ever-growing dependency and resource of modern organizations, widely applied to a multitude of organizational settings.

According to Bowen and Fry (1997) three dominant constructions emerge from small groups development: the group development construction, related to how participants and facilitators mutually negotiate relationship in consecutive phases; the functional effectiveness construction, related to goals, role procedures and interpersonal relations; and the group-in-context construction, concerning patterns of interaction with stakeholders in the environment. These authors say that all groups develop through a process of "concrescence". According to these authors, time provides a fundamental angle on group formation and development, and it is viewable as a context, a resource, and as a moderator or a mediator of other processes. Also, change as an adjacent process is viewable as progressive, contingent, episodic, continuous, or related to endogenous and exogenous factors.

As a general overview on group development literature, Smith (2001, p. 38) asserts that several of the models share similar variables. He explains that they "exhibit similarities in terms of their form, patterns of progression, terminology, and even the nature of the phases or stages that are posited by the theorists". This author explains that factors influencing this outcome may be related to geographical closeness of theorists; school of thought affiliation; relatedness and similarity of groups studied involved in building of the theoretical frameworks; and scientific trends popular at the specific time

of the creation of the theories. As differences, Smith points out that while the groups aimed at the different theoretical settings shared many characteristics, they frequently diverged in matters such as “purpose, environment and (...) meaningfulness of the task to the group”. Besides this, the author also points out the multitude of origins of fields of study of the authors involved in group development studying. Associated to these differences, are also the different methodological approaches undertaken: techniques such as observation, questionnaires and surveys, group document's reviews, and interviews have been used in different research contexts and paths. Both reasons play a major role in the differences that emerged later on in different theories. Moreover, given the fact that most of the group development theorization focused upon specific group types, differences may arise when specific theories are applied to group types that are non-applicable. Other topics of aggravated importance include the effect of group size on development and whether a group is real or simulated.

Similarities and Taxonomy Frameworks

According to Smith (2001), studying of group development was initially carried out through researches into group problem solving and experimentations related to the ruling of psycho-analytic groups in England. These days, however, the number of group development theories has flourished to an enormous amount. Still according to Smith (2001), by 1959 a couple of authors estimated the total number of group development theories to be over one hundred, while many of these theories share some conceptual foundations and fragments (among them, some share even their standing stages of development).

Along his research, Smith (2001) revised a whole array of literature and found five classification schemes of the group development theorization family (Gibbard, Hartman, & Mann, 1974; McCollom, 1990; Mennecke, Hoffer, & Wynee, 1992; Poole, 1989; Shambaugh, 1978)[1]. Remarkably, he underlines that all of the considered categorizations schemes featured a general-sense linear category of group development theories, however under different designations: in McCollom's (1990) categorization, for instance, a couple of the prescribed categories – performance and emotional models – relate to specifications that are dearly to linear models. On the other hand, three (or even four) out of the five models considered comprise a category "describing recurring, pendular or cyclical phases" (Smith, 2001, p. 16).

Based, as a starting point, on Mennecke et al. (1992) categorization[2] – which on its own account was based on Gibbard et al. (1974) work[3] – Smith (2001), in his taxonomy, identifies three fundamental sets of group development theories: linear, progressive models; cyclical and pendular models; and non-sequential or hybrid models.

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[1] According to Costa (2013), several other taxonomies exist: Morgan, Salas and Glickman (1994) advocate a two model type styling: linear and non-linear models; on their own turn, Arrow, Poole, Henry, Wheelan and Moreland (2004) believe group development theories unfold into five types: sequential stage models, repeating cycle models, robust equilibrium models, punctuated equilibrium models and adaptive response models; Akrivou, Boyatzis and McLeod (2006) base their systematization on the concept that all group development models are divided into either those that ground all group development theory on basic psychodynamics or those that account for the time factor on group development as the most determinant influence; finally, both Wheelan and Kaeser (1997) and Bowen and Fry (1996) include group development models in four types: linear, spiral, polarized and punctuated equilibrium types.

[2] Mostly on the grounds that it was the most recent of the ones considered, but also because it contained the two most popular types of models identified in the remaining categorizations – linear and cyclical types of models (Smith, 2001, p. 16).

[3] It did, however, accommodate a big deal of modifications in Smith's (2001) iteration, namely: a) the life-cycle models were transferred from the cyclical category into the linear progressive one; b) the non-sequential division was made to include hybrid models, accounting for two of these models' types – the models that emerge as a combination of more than one previously-existing models, and the ones that fall into Poole's contingency models category and therefore address group development through a contingency-constrained perspective (Smith, 2001, p. 16).

Linear models are the most frequent kind of group development theoretical build-up, characterized by a “definite order of progression” (Smith, 2001, p. 17). In this type of model, one could only go from one step (called “stages*”* or “phases”) of group's development ladder into the next one, not being allowed to skip directly into a latter, nonadjacent step. Smith clarifies, however, that models taken with a “life-cycle” approach are also included in this section. The cyclical and pendular models are characterized by the possibility of a specific group to come across the same stage multiple times, for a multitude of reasons. This may be due to changes in the external environment, group's setup, or even in the task at stake. Here again (as in linear models), later stages of development mean an overall better understanding and dealing with contingency factors by the group. As these models are non-linear, the order of the prescribed stages is not as important as in the case of linear models; therefore, groups can swing back and forth through multiple developmental stages while trying to find a workable solution to their needs. Non-sequential and hybrid models refer to a kind of models that are mainly directed by the influence exerted by environmental factors and don't hold a rigid event succession, frequently combining elements from several previous types of models to produce a new, broader theoretical account on group development's reality.

A similar effort has been made by Chidambaram and Bostrom (1996) who also based their review of group development theories on previous work by Gibbard et al. (1974), which divided it into three fundamental subsets of theories – linear progressive models, life-cycle models and pendular models – and expanded it further in order to

accommodate recent developments in group theory. According to the referred authors (Chidambaram & Bostrom, 1996; Gibbard et al., 1974), theories are divided into sequential models – that unfold into the progressive and cyclical subtypes – and non-sequential models – that are divided into time-based and structure-based conceptualizations of group development (Chidambaram & Bostrom, 1996, p. 161).

According to Chidambaram and Bostrom (1996), linear progressive models are characterized by the development over four fundamental stages: a) individual members' aggregation; b) conflict; c) cohesion; and d) productive work. These authors also stress that cyclical models, while describing nonlinear sequences of events, keep a sequential structure nonetheless. Some of these models – the ones that make part of the "life-cycle models" subtype – to a certain degree emulate life-cycle events in the sense that individual development usually undertakes stages comprising birth, growing and death occurrences, sometimes even including rebirth phases encompassing a corresponding recurrence through the whole process. Furthermore, as some groups face impending adjourning, its members may adapt their behavior in order to address such event. In recurring cycle models (the other subtype of cyclical models), although groups are described as phenomena that progress in a sequential fashion, regression into earlier stages of development is also admissible. Therefore, returning to previous stages is expectable and acceptable even if groups are consistently adhering to the developmental process in successful terms. Finally, non-sequential models' approach focus more on assessing contextual elements that hold an underlying influence in group development, without prescribing a predetermined order of events. One of its subtypes – time-based

models – focus on the influencing strengths of the time dimension, such as pressure exerted upon deadline fulfillment, duration of group existence, among others. Non-sequential structure-based models, on the other hand, concern a specific type of models that describe group development as an adaptation process that emerges upon the appearance of characteristics in the environment.

On the grounds that it features a more recent account and a broader, more representative review of group development theoretical body, we elected Smith's (2001) categorization as our main framework. Therefore, in the following section, in spite of some considerations being also based on the work of Chidambaran and Bostrom (1996), we present in a more detailed way each one of the categories proposed by Smith.

Main Categories and Models

The authors we've been referring to in order to address group development's taxonomy of existing models (Chidambaram & Bostrom, 1996; Smith, 2001) also reference some fundamental models in each category of their taxonomy.

Sequential, Linear Models

Concerning linear models, Smith (2001) tries to review several relevant models by comparing them stage-by-stage. In order to do so, a crosswise general outline of the stages considered in this sort of models was drawn. The first stage – the “forming” – is usually one related to the seminal moments of group formation, when group members gather around a common physical space and get to start knowing each other. This time is characterized by the individual identity formation inside the group and definition of the task. As a way of coping with stress involved in group formation, group members usually

display a reversion into the adherence of social norms concomitant with situations similar to the one at hands. Shall there be a leader of the group, this is the moment when it emerges as legitimate or otherwise; there's also a high reliance on the leader by other group members. Then comes the “conflict and unrest” phase that arises due to group members better knowing each other and having a certain degree of mastery of group's rules. In face of these conditions, conflict ensues as a fight for power and leadership, and unrest may occur. Group members rely on the leader to get through their quest to become highly independent from his teachings. Another reason for conflict may be the need for group members to fight for the maintenance of their individual identity despite group's dominant dynamics, which might be flowing in a different direction. As a third general-purpose stage identifiable in the literature, there's the formation of group identity and group norms. In this stage, a sense of cohesion emerges, which is only possible because most of the previous tensions where properly resolved; after that, more energy is available to direct into group's assigned tasks. As such, this is a performing stage of group development; it may, however, not even come to occur, as previous differences and pretexts for conflict may not have been thoroughly solved. Then comes the stage of “production”, following the establishment of cohesion and continued productivity. In this stage the group is widely adaptable to internal and external stress, and its functioning became more flexible. The final stage of linear models is one of “adjournment or termination”: disbandment of the group happens if its functional reason no longer exists. In some models this stage was a late addition or is even absent. Group dissolution may happen because it has accomplished the tasks it was meant for; because its existence was

only meant for a designated amount of time; because the group failed to form properly and didn't reach the minimum conditions of subsistence; or because the group suffered from “maladaptation” issues and was not able to properly deal with inner and outer contingencies. Also, it may arise because of increased rigidness and inability to properly respond to these stimuli. Concerning cyclical and pendular models, some of their stages show similar characteristics to those of linear models.

Chidambaram and Bostrom (1996) also point out that one of the first significant models articulating the fundamental cornerstones of linear progressive models was that of Bennis and Shepard (1956) which assessed group's growing maturity based on the increasing of communication patterns among team members[4]. Other similar models dealing with developing processes in work (Heinen, 1971; Jacobson, 1956) and therapeutic groups (Kaplan & Roman, 1963) also contributed to reinforce the adequacy of the general structure pertained by this type of models. Focusing on a different angle but still through a sequential, progressive perspective, Bales and Strodtbeck's (1951)

[4] Through the lenses of this theory, communication constitutes the greatest foundation groups are to develop. Multiple authors (e.g., Alves, 2012, p. 64) stress that this model consists of two main stages, encompassing several substages: the first one – dependency – deals with the relationship that group members maintain with the authority figure, and is subdivided into substages one (dependency-flight, which is characterized by a dominance of superficiality and submission), two (counterdependency-fight, in which group members split into turning to either dependents, counterdependents or independents) and three (resolution-catharsis, when the group begins to have a sense of competence aiming at determining its own path and the dependency issue is resolved); and the second one – interdependency – which emerges once the group is done resolving most of its frictions and conflicts, and moves towards dealing with intimacy issues among members. The second stage consists of substages four (enchantment-flight, when a general state of “lightness” and cohesiveness occurs), five (disenchantment-fight, characterized by a collapse of the original group into the formation of several subgroups, along with a generalized concern about self-esteem, ranging from members bidding for an overall “unconditional love” [Bennis and Shepard, 1956, p. 430] to those who believe strainer boundaries should be imposed for the sake of personal safekeeping) and six (consensual validation, which occurs when members reassess their behavior following their awareness about the eminent adjournment of the group, and make way for resolution efforts through appropriate discussion by its members; group’s value at this point is established and undisputed).

equilibrium model bases its foundations on the concept that the group goes through an ever-developing balance effort between either compensating its socioemotional or task needs, with the bulk of group's efforts being channeled to one of those sets of needs at the expense of the other, at a given time. Further research (Bales, 1953; Heinicke & Bales, 1953) found there was a dominance of acts oriented toward suppressing task needs in earlier stages, while the opposite trend was observed concerning the acts geared toward suppressing socioemotional needs, which progressively amassed onto the latter stages. According to Smith (2001, p. 25), this model fits better the category of cyclical models, because while it "may appear to indicate that groups develop in an orderly fashion from the orientation stage through to the control stage, a group may swing freely back and between any of the stages until it finds a workable solution for achieving its objective(s)". As so, equilibrium model's true nature and righteous categorization is therefore still a matter of dispute.

Recurring, Pendular and Cyclical Models

Also reviewing some of the more relevant cyclical and pendular models, Smith (2001) asserts that these models base their insights on an analysis that considers group development as responding to three key factors: changes in external environment, changes in group membership and changes in the nature of the task (p. 25). He remarks that the order of the stages in these models is not as important as in the linear, progressive ones, but in order to duly develop groups must properly resolve the challenges faced in every stage. As stated by the author, "there does not appear to be a strong pattern of similarity in terms of how the models were developed" (Smith, 2001, p. 27); however, he

draws their general stages of development (grounding on their commonalities), as follows: the formative stage, which is similar to linear model's first stage, relating to group members' physical gathering, the definition of group's character and the scope of its purpose, including what are they set to do and the challenges they face. In exchanging all the information they're required to in order to excel in this early stage, group members end up defining group's and task's concise boundaries and establishing goals; personal relationships among members develop and the building of a membership atmosphere starts to surface, however keeping a certain degree of superficiality in its earlier moments of formation.

Then comes the information gathering, goal and role clarification phase. In this stage, the group usually takes on a reflexion upon all the data it has been able to gather concerning group tasks and tries to set a correspondence with its members' skills and abilities, mediated by the goals envisaged. "Pairing" behavior starts blossoming, usually in the form of dyadic relationships among group members who share coinciding characteristics. Working as open systems, one of groups' essential processes is to accommodate new insight from individual members and revisit previous judgments and courses of action and assess their continued pertinence. The group also undergoes a "readjustment of structure" and alters its relationships in response to a clearer overall understanding it now has of the challenges it faces. A note must be made concerning the potential overlapping of some of the stages, a feature justified by these models' inner characteristic of recurrence of events (Smith, 2000, p. 27), favoring greater development and understanding of the situations. After this, there's the decision-making and structural

stabilization phase, when the patterns of group behavior concern how work is done and relationship functioning reaches a certain degree of constancy. It is, therefore, of flagrant importance that group members agree on the method they're following to pursue group's set of goals, given their progress in social and relationship structure, in the direction of evolution. In the course of this, it is only natural that the ideas from some of the group members prevail, while other are superseded and dropped. As reinforced concepts of support, trust, affection, authority and influence emerge, it is only natural a certain amount of conflict is present, generally being precedent to positive outcomes. Finally, in the implementation production the group carries out its prescribed set of actions as planned. This stage features a "state of complex interdependency" (Srivastva, Obert, & Neilsen, 1977), while entangling very thoroughly a high degree of cooperation among differentiated group members who are highly aligned towards achieving task's perceived aims. Assessment of group's own performance is also carried out; hence the importance of recurrence stances in accomplishing the objective of meeting the expectations. Swinging to an earlier stage of development can occur in multiple times (Smith, 2001, p. 31), for instance, any time after one of group's meetings (Bradford, 1978) or whenever member's emotional needs supersede its normal functioning and evolving (Bales & Strodtbeck, 1951).

Chidambaram and Bostrom's (1996) recognize that the work of several authors (e.g., Dunphy, 1964; Mills, 1964) reflects the effort by group members directed towards addressing the ending event, frequently by designing a final, suitably-crafted stage, in which group members try to fit their behavior in ways intended to deal with the

adjournment of the group more adaptively. Increased involvement in task-related activities and concern over transmitting group norms to newer group elements are also identified occurrences connected to this stage. In the work of Mann (1975), which explored group development through observed behavior of group members toward the leader, he identified continued depression and increased personal involvement in the course of group's final moments of existence. On the other hand, in Spitz and Sadock's (1973) life-cycle model, group adjournment was identified to precipitate separation anxiety. Fear of group disbandment was ordinarily identified throughout further research (e.g., Braaten, 1974; LaCoursiere, 1974; Yalom, 1975)[5].

A milestone example of recurring cycle models is Schutz's (1958). The FIRO (*fundamental interpersonal relationship orientation*) model has its cornerstone elements established as two fundamental assumptions: after a set of traditional, growing-related phases of group development, groups are considered to enter a regressive part of the cycle, which includes decreased bonding and mutual interactions among group members. Alves (2012, p. 64) adds that this model encompasses three stages[6], in which subjects may relapse to previous stages or halt in one of them, therefore not being able to fully

[5] All these studies were based on therapeutic (Kaplan & Roman, 1963; Yalom, 1975), training/student (Bennis & Shepard, 1956; Kaplan & Roman, 1963; LaCoursiere, 1974) or various different types (Braaten, 1974) of groups (Chidambaram & Bostrom, 1996).

[6] In each of these stages, member behavior is predominantly geared towards satisfying his own interpersonal needs of inclusion, control and affection. Each of these needs is related to a different stage of group development that is revisited as necessity determines: in the first stage – that of *inclusion* – group members seek out their colleagues' approval and make decisions related to the boundaries they're available to establish as well as those they're willing to let others cross; in the second stage – *control* – members try to establish an interpersonal sense of competence related to their ability to influence others and to take responsibilities while also confronting other members with issues related to group's structure and leadership; finally, in the third stage – *affection* – the attention of group members is more oriented towards intimacy issues, raising mostly positive but also some questionable affections on other group members (Alves, 2012, p. 64).

fulfill it. Research by several authors (e.g., Bion, 1961; Stock & Thelen, 1958; Thelen, 1954; Parsons, 1961; Hare, 1973) attested the existence of recurring patterns in group development, either involved in specific problem-solving processes or as a general-purposed, cycle-round revisitation of earlier developmental stages. Slater (1966) introduced the notion of an extant proneness to conflict between individual identity and the tension leaning group into cohesiveness, with ensuing emergence of regressive tendencies in group development as a result.

Non-sequential and Hybrid Models

Smith (2001) clarifies that the models that fall into this category "do not have a prescribed pattern of developmental events" (p. 31) or "combine several different models to form a new model" (p.17). The models of Gersick (1988), McGrath (1991) and Giddens (1979), that we are going to briefly characterize in the next paragraphs, are important references of non-sequential models. The model of Miguez and Lourenço (2001) [MIDG], in which we anchor the present research, and that we are going to present in a detailed way in the next section, can be classified, similarly to those of the Sheard and Kakabadse (2002) and Wheelan (1994), as a hybrid model.

Gersick's punctuated equilibrium model (Gersick, 1988) constitutes an established milestone in the subcategory of time-based models (Chidambaram & Bostrom, 1996), setting the tone for a framework that settles for an alternation between growth and stagnation phases of group development, through a punctuation in a middle point of group's existence that accounts for a drastic change on its behavior, mostly as a response to temporal-related sources of pressure. Through the studying of several natural and

laboratory-generated groups, researchers identified as a general rule in groups the existence of this “punctuated” turning-point, about halfway into their development history. This model is constituted by two main stages (Alves, 2012, p. 66): *inertia phase*, characterized by an overall state of stability following the behavioral approach that’s been predefined by the group during its formative stages; and a *revolution phase*, consistent with the turning-point identified earlier, in which a transition into redefined behavioral patterns takes place; finally, a new inertia phase occurs, putting to work the newly defined methods and attitudes towards the task at hands. This model holds the merit of being one the first trying to identify which factors were adjacent to group development instead of merely holding a description of their perceived course of development (Chidambaram & Bostrom, 1996).

McGrath's (1991) work tried to answer concerns raised by previous theories, which were seen as having failed to correctly account for both temporal and social variables. As such, his model is based on the time-interaction-performance (TIP) theory, which encompasses the key concept of social entrainment, an articulate framework overseeing the implementation of multiple group processes through synchronized means and coordinating routines lead by group members. This coordination effort occurs on multiple levels, including the systemic, social-wide level, and these group processes may be set-off by the occurrence of either inner or outer-sourced events. Group development happens, thus, mostly through the auspices of social entrainment, by dealing with contingent change, as it occurs, through group synchronizing maneuvers, instead of prescribing it through a static sequence of stages.

Finally, the adaptive structuration theory, or AST (Giddens, 1979), conceives groups as walking their development path based on the uniqueness of the solutions they make up for in response to external influences. Responding to the perceived potential foreseen in existing structures[7], groups will make use of them in singular ways. Through the "appropriation" process (that lasts for the whole development cycle), group members will render the structures usable and enact their first interactions towards them, as ways to take advantage of them as a support system, and inevitably filling them with meaning. Structures may be assimilated and translated into function as they were supposed to from the start – "faithfully" – or their purpose may be misinterpreted or distorted – "ironically" – as the group sees fits best. This theory doesn't interpret the dawn of group development as emerging from the introduction or manipulation of external support structures, but instead as a result of the adaptation of these structures by group members, so they can be better fitted to group's specific needs. As groups want to evolve into effective appropriation, they should seek for "faithfulness" toward structures' intended aims, positive "group attitudes", and meeting an overall high "consensus" over the usage of the structures, thus attaining the three fundamental pillars of successful appropriation – which is only normal to take proper time. This theory is adequate to explain variations in group development through the course of time, and acknowledges adaptability toward external variables as socialization's desired outcome, in a way that the right structures are ultimately picked.

[7] Defined as "rules and resources which actors use to generate and sustain [the group entity]" (Poole & DeSanctis, 1990, p. 179).

Finally, we should highlight the contributions from Wheelan (1994) and Sheard and Kakabadse (2002) as examples of theories combining several different models to form a new model. Wheelan's (1994) integrated model of group development (IMGD) builds heavily on the principles originally set together by Tuckman (1965) while also taking influence from the conceptual foundations put forward by Bion. Being a linear model in essence, it also accounts for a perspective that perceives group maturity as something emerging from team members working jointly. In the frame of this theory – and giving expression to its hybrid character – groups are expected to move forward into later stages of development but are also admitted to move back into earlier ones, should certain conditions arise: appearance of specific external demands, team members/leader turnover, changes in tasks/missions, occurrence of fusions or tasks' adjournment, to name a few. According to this model, to certain stages correspond certain talk patterns, and some specific issues are particular to a given phase of group development. The four initial stages are pivotal to serve the purpose of groups attaining a functional, effective and productive state. In this section of development, groups undergo changes that make them switch from a dependence towards the leader into achieving interdependence among team members. The first stage – "dependency and inclusion" – is characterized by team members having considerable concerns over safety and inclusion, relying heavily upon the leader. In the second stage – "counterdependency and fight" – conflict outbursts among team members, as fundamental disagreements start to emerge; over time, groups start establishing its own set of norms, goals and procedures[8]. Stage three –

[8] Conflict is known to contribute for the establishment of trust and a climate in which members feel safe enough to disagree with each

"trust/structure" – is characterized by an increase in trust, commitment, and willingness to cooperate, and more mature negotiations concerning everything group and organization-related are now possible. Stage four – "work/productivity" – is achieved when the group is stable enough to engage in good levels of productivity and effectiveness, focusing most of its energy on goal achievement and task accomplishment. The last stage – "terminus" – is only relevant in the cases of groups formed with a preset lifespan in sight, and is characterized by anxiety of disbandment and some conflict.

Sheard and Kakabadse's (2002) integrated team-development framework (ITDF) combines the four basic stages from Tuckman's (1965) model with Kübler-Ross's (1969) concept of transition curve (focusing on the dynamics of personal change), giving rise to a wheel-shaped group development theory. It tries to explain how a so-called "loose group" – characterized as being made by a number of individuals brought together to achieve a specific task – can be transformed into an "effective team" – one in which a supportive social structure has developed, fostering the adaption of personal behaviors in a way that they can be more adequate to contribute to the team. During this transition, four "basic elements" of group development must be integrated into the overall process: task, group, individual and environment. Nine key factors serve collectively to differentiate a loose group from an effective team. Those related to the basic element "task" are as follows: the existence of clearly defined goals (in loose groups individuals opt out of goals not understood, whereas in effective teams goals are understood by all);

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other without fear of being marginalized or ostracized by colleagues (Wheelan, 1994; Wheelan & Hochberger, 1996); furthermore conflict seems to help establish communalities in goals and shared norms, and to clarify psychological boundaries and each one's role (e.g., Lewin, 1943). Previous research (e.g., Dunphy, 1964; Mills, 1964; Tuckman, 1965; Tuckman & Jensen, 1977) suggests conflict is a fundamental player in enhancing cohesion and cooperation later in the life of groups.

and the establishment of priorities (in loose groups the loyalty of individuals is split among several groups, whereas in effective teams a cohesive team alignment is noticeable). Those related to the basic element "individual" are as follows: clearness of roles and responsibilities (in loose groups these are unclear and with gaps and overlap, whereas in effective teams they're duly agreed and understood upon by individuals); and the level of self-awareness (associated with an individual's ability to be aware of the impact his behavior has upon his surroundings; in loose groups individuals usually don't have a good insight about how detrimental to group functioning the consequences of their actions can be, whereas in effective teams behaviors usually are appropriate considering team needs). Those related to the basic element "group" are as follows: type of leadership (in loose groups it tends to be more of the structuring type, whereas in effective teams it tends to be more based on catalytic methodologies); nature of group dynamics (in loose groups each individual tends to worry more about himself, whereas in effective teams a social system is established and accepted); and communication (in loose groups it is more formal, whereas in effective teams an open dialogue is more frequent). Finally, those related to the basic element "environment" are as follows: type of infrastructure (in loose groups it tends to be more task-oriented, whereas in effective teams there's a stable support enacted from organizational infrastructure); and characteristics of context (in loose groups it also tends to be more task-focused, whereas in effective teams it is influenced – without it being controlled – by the organization).

Chapter 3: The Integrated Model of Group Development (MIDG)

The Integrated Model of Group Development (MIDG[9]) is a group development model that integrates the sociotechnical perspective and is influenced by Lewin's Field Theory (e.g., Lourenço & Dimas, 2011; cf. figure 1).

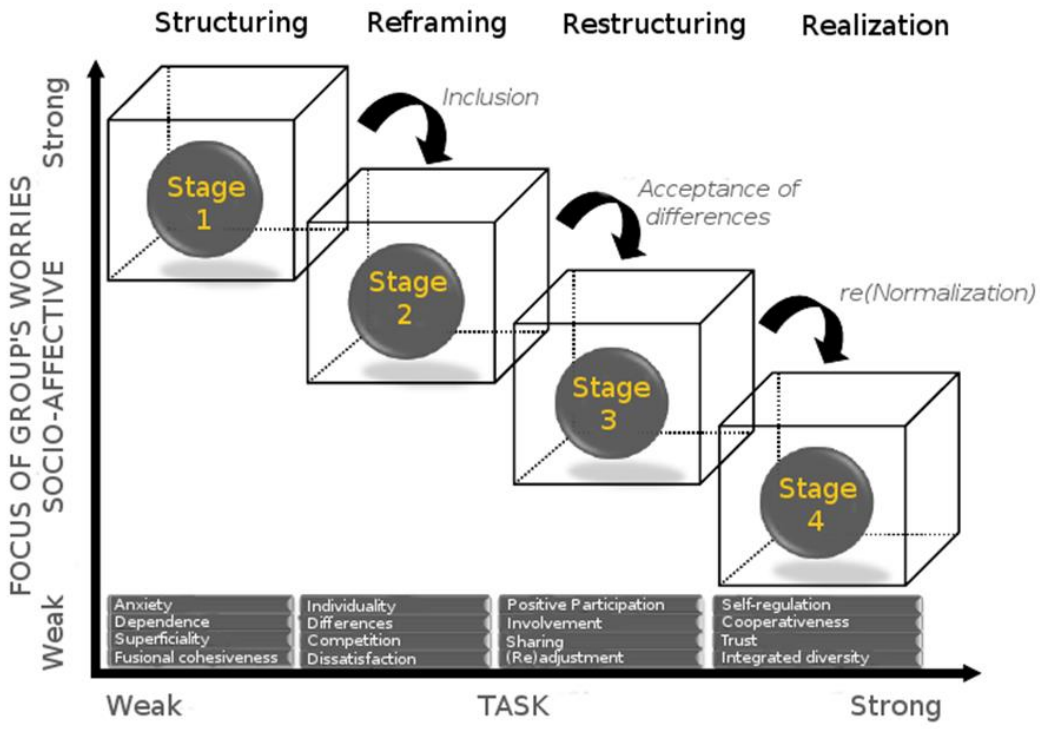

Figure 1. Description of the Integrated Model of Group Development (MIDG). Adapted from "O Grupo revisitado: considerações em torno da dinâmica e dos processos grupais," by P. R. Lourenço and I. D. Dimas, 2011, in A. D. Gomes (Eds.), *Psicologia das Organizações, do Trabalho e dos Recursos Humanos*, p. 180. Copyright 2011 by Imprensa da Universidade de Coimbra. Adapted with permission.

[9] In Portuguese: *Modelo Integrado de Desenvolvimento Grupal* (MIDG).

Placed somewhere between linear, cyclical and polar models – given it carries elements taken from all three kinds – it builds upon a foundation of two different subsystems, taking the group as an "intersubjective reality": the task and the socio-affective subsystems. There are a number of constricting elements which must be present for it to emerge – the basic driving forces. Those are as follows: (1) group members must be interdependent (and perceive that interdependence); (2) there must be at least one mobilizing goal perceived as common to the group members; and (3) relationships among group members emerge according to the pursuit of the goals considered (N. Pinto, 2012).

The group development process is conceived as a succession of four stages: Structuring, Reframing, Restructuring and Realization (Lourenço & Dimas, 2011). As the group progresses through the different stages, it tends to center its focus mostly – but not only – on one of the two aforementioned subsystems. MIDG incorporates two distinct development cycles, which alternately make the group focus more on one of the subsystems: while the group is going through the two initial stages, it tends to focus more on the socio-affective subsystem: it's the socio-affective cycle. By contrast, when the group is going through the last two stages, it tends to focus more on the task subsystem: it's the task cycle (N. Pinto, 2012). In order to progress to a next stage, previous stage issues must be thoroughly settled and satisfactorily resolved – and in order for that to happen, the group must engage in processes of inclusion, acceptance of individual differences and (re)normalization (e.g., Lourenço & Dimas, 2011; A. Pinto, 2014; Rodrigues, 2008; cf. figure 1). Inspired by Lewin's theory, the MIDG perceives group development as occurring within an arena of tensional forces – it is as the restrictive

forces (present at the boundaries between stages) wear off that the propelling forces are allowed to emerge and outdo their restrictive counterparts, therefore facilitating group's progression into later stages of development (Agazarian & Gantt, 2003).

In the first stage, Structuring, all team members rely heavily on group leader and are filled with feelings of anxiety and uncertainty. Fear of rejection is high, as group members cross uncharted territory of initial group life. As the dependence towards the leader is high at this time, group members try to please him as well as other group members in various ways, in order to avoid feeling left out of the group. This also extends to strategies of avoidance on conflict situations, which tend to be common at this stage. Unanimity and conforming among team members is high, and there's a lot of latent tension arising from differences which remain concealed among colleagues. Sometimes, there's a sense of euphoria stemming from the fact that they seem much more alike than what they truly are. As a general rule, it's imperative that by the end of this stage the feelings of loyalty, security and desire to be in the group are dominant among team members (Lourenço & Dimas, 2011). In the second stage of development, Reframing, group members try to break loose from their perceived dependency towards the leader. This happens as a way of empowering their identity and autonomy within the group. Disagreement among group members becomes evident and conflict is on the rise, both between subgroups and individual members. There's a whole array of subgroups emerging and competitiveness is everywhere, mainly as a way of propelling personal assertion. Proper difference management among group members is in short supply and is greatly needed. The leader gets attacked by coalitions formed to erode his authority, and

sometimes other coalitions rise up to defend him. Many times, the level of conflict is so intense that it has a blockage effect on group productivity. This phase is of the utmost importance, however, since the freedom for team members to disagree with each other at this point is crucial so that later there can be an overall sense of trust among them. Then comes the Restructuring phase, characterized by the beginning of the second cycle of group development – the task cycle, focused on the task subsystem. At this stage, there is a development of a sense of trust among group members, desire to cooperate is on the rise, and the overall sense of commitment towards the group is growing. Along with the trust increment comes better involvement in the tasks being taken care of by the group. Interdependence is now a reality, as is the willingness to accept other member's differences and work towards making sense of common aspects among group members. People are more mature when negotiating the various group assets among each other, and both individual roles and group norms are periodically redefined. Finally, in the last stage of development, Realization, the group has reached a state of plenitude and is willing to share responsibilities and engage in a highly cooperative, absorbing and trustful environment. Communication is fluid and consistent, allowing for a deep involvement by everyone, and there's a clear sense of what others are willing to tolerate, allowing everyone to enact an active participation. Group members are prepared to share – as well as receive – insight on each other's performance appraisal in a constructive way. This stage is characterized mostly by self-regulation and cohesion reinforcement. Since group has reached its maturity, both group and individual identities have come out strengthened.

MIDG is the case of a model that's comprehensive (because it tries to explain group development as an integrated process, accompanying changes occurring in a variety of group settings), generalizable (because intrinsically it aspires to build a set of rules that allow for the identification of patterns that can be useful to the studying of other group phenomena), and path dependent (because it takes into account both the individual and group history when explaining group development as a process that occurs through time).

In addition to these properties, we should also conceptualize MIDG as a systemic framework in its own right, influenced by the learnings elicited from the experiments undertaken at Tavistock Institute (A. Pinto, 2014): a) it is abided by *holism* – meaning it conceives the system as a result stemming from the interaction of its parts, whose "whole" should account for a different result comparing to the sum of its parts, and whose studying should be done keeping the relationship between these two components in mind; b) it is an *open system* – meaning it perceives groups' inherent complexity through a lens of wideness and comprehensiveness, allowing it to elicit an overall sense of wholeness; and c) it is characterized by a sense of *oneness* – meaning groups should be conceived as an organized aggregate of interdependent and interacting elements operating in an articulated manner.

This model features an "integrated view" on group development: it incorporates multiple theoretical backgrounds into a framework that's simultaneously highly differentiated, integrated and complex, attributing a unique *gestalt* to its underlying group processes and overall functioning (Lourenço & Dimas, 2011).

It draws its influences from multiple theoretical roots. Firstly, the MIDG is highly influenced by three main linear models: Bennis and Shepard's (1956) group development theory, whose conceptual grounds acknowledge the existence of two main stages that are very dear to MIDG framework – dependence and interdependence; Tuckman's (1965) and Tuckman and Jensen's (1977) four-stage model, from which MIDG sips the same sense of dependence (contained in the *forming* stage), interdependence (pertained both in *norming* and mostly in *performing*), while also featuring moments of counter-dependence (which is the case in the *storming* stage)[10]; and Wheelan's (1994) Integrated Model of Group Development, from which MIDG collects some major influence, given that both the MIDG and this model conceive group development over a comparable number of developmental stages (although Wheelan's model accounts for an additional fifth one, the final "terminus" stage, unaccounted for in MIDG) sharing most of its fundamental ideas – the first stage is dominated by themes of dependence and inclusion; conflict is the most widely discussed phenomenon in the second stage; stage three sees group's bonding, communication and individual role structures undergo a reforming phase; and finally the fourth stage brings an overall maturity and productivity state to the group.

The authors (Miguez & Lourenço, 2001) underline MIDG's sociotechnical orientation, that's not present in Wheelan's (1994) model – it accounts for the existence of two basic subsystems that have a determinant impact upon the foundation of the group. One of these subsystems – the socio-affective one – is more prevalent in the group

[10] In this type of models, a shifting of qualitative nature is usually very noticeable as groups develop into later stages, concerning aspects such as the settling of clearer objectives and individual roles, as well as the developing of enhanced communication processes and relationships among team members.

developmental processes of the first two stages (when concerns about inclusion and membership in the group – and later on, about the existence of an assertive attitude – are most prevalent), while the other one – the task subsystem – has a more decisive impact upon the two latter stages (when the group is oriented towards increasing both collective and individual contributions, and ultimately – in the last group development stage – to be able to reach an optimal productivity level; Dimas, 2007). These two subsystems interact in a decisive way as founding elements of any group, and are present throughout its existence at varying levels.

As it's ascertainable from the previous analysis, MIDG features many characteristics coinciding with those of several milestone linear models: the most incisive one being perhaps its basic structure of a succession of stages, moving groups progressively from dependence towards interdependence. MIDG also features, however, some elements from non-linear models. Resembling St. Arnaud's (1978) cyclic model – which builds on psychodynamic premises – MIDG assumes that the energy required to consummate the mobilization of groups is dependent on the existence of both a common goal (that can change over time) and the enhancement of group member's interpersonal relationships and interactions as means to interdependently achieve the fulfillment of the aforementioned goals. Once again, the prominence of either the socio-effective or the task subsystems is inescapable, alternating themselves in varying degrees of intensity throughout the developmental process.

Miguez and Lourenço (2001) also account for the possibility of groups either halting their developmental cycle, or having a regression to previous stages – mostly as a

consequence of either internally or externally-imposed contingencies, including changes upon group's objectives, changes in both group's membership and leadership, possible fusions, or the fact that a specific task came to its conclusion. Therefore, group maturity is by nature only transient. These possibilities reflect the influences borrowed from cyclical models, namely that of Worchel (1994) that also brings to the MIDG notions from the explicit and implicit levels of action, which are recurring themes in cyclical models.

Finally – and constituting one of its most important aspects – the whole model is based on the concept that these two subsystems act as opposing poles, garnering from that conflict the necessary energy to move the group onwards – which amounts as a basic feature of polar models (e.g., Pagés, 1968; Smith & Berg, 1987). The first developmental cycle – socio-affective – is characterized by the tension between the poles of dependency and interdependency, ultimately generating the necessary energy to the existence of a full-fledged interdependency at the task development cycle. Failing to mobilize this energy may lead the group into stagnation and ultimately its demise. Besides this, throughout the whole developmental process there's a noticeable tension between concerns of an individual nature and those relating more to the group, that alternate themselves in the dominance of group's agenda until a balance between them can be reached. By this time, the group's overall maturity allows it to take advantage of both these elements at their maximum intensity (Lourenço & Dimas, 2011). In the course of the second developmental cycle, however – the task subsystem – group members are usually more focused on finding ways to achieve the goals set forth by the group.

The set of processes taking place across stages can be rooted to Brewer and Pickett's (1999) optimal distinctiveness theory, which postulates the self as being driven by two opposing needs – the need for assimilation (to favor group acceptance) and the need for differentiation (to foster personal identity). This theory establishes group affiliation as pivotal in fostering a stable self-concept; it must be kept in balance, however, with the unremitting need of feeling unique as well. These tensions will define how an individual wishes to be perceived at a given time – the tradeoff between the social identity resulting from group membership and the drive emerging from these tensions should allow for the yielding of an optimal level of differentiation. Through the course of group development as perceived by the MIDG, these tensional poles are considered complementary instead of incompatible. Stage 1 sees the need for assimilation prevail, as group members have to deal with the anxiety related to attaining group membership status and are overall eager to be a part of it. The need for differentiation starts emerging soon after, when group members start feeling the urge to move away from the widespread fusional sentiment, which is exactly what happens in stage 2, when the need to differentiate is more salient, and individuals activate mechanisms intended to restore this balance. Over time, they try to resolve their dependence towards the leader and to assert their differences within the group, which is expressed through the growing willingness to participate and contribute with their specific skill set to group's activities. As group members progress through stages 3 and 4, they're supposed to feel increasingly strengthened both in their individual as well as group identity.

Later Subsequent Contributions

MIDG framework was used in a multitude of studies encompassing the study of group development, mainly in Portugal. Topics such as intragroup conflict, group emotions, emotional intelligence in groups, leadership, group effectiveness, and knowledge management in groups have been studied with a temporal approach adopting MIDG as framework (e.g., Alves, 2012; Alves, Lourenço, & Miguez, 2010; Dimas, 2007; Dimas, Lourenço, & Miguez, 2008; Laura Marques, 2014; Luís Marques, 2010; J. Oliveira, Miguez, & Lourenço, 2005; M. Oliveira, 2011; M. Oliveira, Dimas, & Lourenço, 2012; Peralta & Lourenço, 2011; A. Pinto, 2014; N. Pinto, 2012; Rodrigues, 2008) and the results of those researches tend to support the assumptions of the model.

Lourenço (2002) studied group development literature in detail, and contributed to the foundations of MIDG in aspects such as the clarification of its sociotechnical approach, the establishment of group development within the context of the study of group phenomena, and the articulation of this construct with group effectiveness. One of the main contributions of his study was, however, discovering a new, bi-factorial structure for Beaudin and Savoie's (1995) and Savoie and Beaudin's (1995) four-dimensional model of group effectiveness – and, therefore, pointing in the direction of a sociotechnical conceptualization of group effectiveness, encompassing both task and socio-affective subsystems. The four original dimensions integrating work teams' multidimensional model (Beaudin & Savoie, 1995; Savoie & Beaudin, 1995) were quality of group experience, team performance, team legitimacy, and team persistency, which emerged in Lourenço (2002) as being only two: organization and maintenance, and

production and reputation. The first describes team members' adaptability, flexibility and cohesion as well as their willingness to remain on the group (it includes aspects related to relationships, organization, management, adaptability and survival); the second dimension focus on the appraisal of the level of reputation achieved as well as group's performance. The second empirical study of Lourenço's (2002) research also had the aim of articulating the constructs of group effectiveness and group development: it tested (N = 99) three hypothesis related to group development. Hypothesis 1 tried to ascertain whether there was a relationship between group development and differences in the conceptions of group effectiveness – he discovered that, as groups progress in development, they're more likely to conceptualize group effectiveness in terms of the organization and maintenance dimension; at the same time, it was not proven that groups tend to quit perceiving group effectiveness in terms of the production and reputation dimension, as group development progresses. Hypothesis 2 tested whether there was a positive relationship between group development and performance – this proved to be correct, as in later stages of group development teams showed to be able to achieve better results overall. Finally, hypothesis 5 checked for a relationship between group development and the existence of newly-arrivals to the team (supposedly causing disruption to team's regular functioning) – this testing did not yield statistically significant results. Along the way, an instrument[11] intended to assess group development based on Wheelan's (1994) model was developed and its content validated.

[11] Group Development Questionnaire – (in Portuguese: *Questionário do Desenvolvimento Grupal* [QDEG]) – is comprised by two sections: a) a 40-item checklist – related to several aspects of group life, both task and socio-affective-related and b) a 5-item ranking scale (ranking order).

Related to MIDG, and with the objective of measuring group development, our research team has already built an instrument called PDE (Team Development Perception, or in Portuguese: *Perceção de Desenvolvimento de Equipas* [PDE]). Its purpose is to identify the stage of group development in which a specific group is at a specific time. The respondents are requested to choose a scenario among a set of four different ones, each one related to a different stage of group development. PDE has been used in many researches in Portugal and its results confirm a good fit when trying to measure the group development stage. According to N. Pinto (2012), however, the social desirability phenomenon is the biggest problem of PDE. In fact, respondents tend to classify their teams in the latter phases of development and to avoid the second phase. With the aim of overcoming that difficulty, our research team considered relevant to build a new instrument. As a result, EDG-D is the object of our study, and was built on the context of the research developed by N. Pinto with sports teams. Chapter 4 focuses more on EDG-D.

On Processes Related to Conflicts

By delving into how conflicts are experienced and managed along group development, Dimas (2007) looked for significant relationships between conflict, group development and group effectiveness, while also trying to ascertain whether intragroup conflict was worth reframing in the light of MIDG. She tested (N = 382) for the possibility of both types of conflict (task and socio-affective) to be (hypothesis 1) at a minimum at stage 1 – it was found that task conflict wasn't significantly less in stage 1 when compared to the remaining stages, and socio-affective conflict was only

significantly less comparing to stage 2 – which is also when it is at the highest. It was found that stage 2 is indeed the one stage featuring the higher level of conflict, both task and socio-affective-wise. She also tried to find out whether (hypothesis 2): a) one would find a more widespread usage of integrative strategies when dealing with conflict in stages 3 and 4 comparing to stages 1 and 2; b) one would find a more prevalent use of dominance strategies in stage 2 when compared to all other stages; and c) one would find a more frequent use of nonconfrontational techniques (avoidance and accommodation) in stages 1 and 2 when compared to stages 3 and 4 – all of these relationships resulted in statistically non-significant conclusions, so all of the hypotheses remained unproved. Finally, she further tried to ascertain whether group development had a negative moderating effect on the relationship between conflict and performance (hypothesis 8) – which also couldn't be proved. Hypothesis 1 and 2 were repeated with a larger sample (N = 321), yielding only slightly different results: in relation to hypothesis 1, it was found that both task and socio-affective conflict were lower in stage 1 when compared to other stages, but only statistically significant when comparing with stage 2; still in hypothesis 1, stage 2 was found to be the most conflict-ridden, only failing to yield statistically significant results when compared to stage 3 in relation to task conflict; concerning hypothesis 2, results showed statistically significant differences in the usage of integrative strategies in stages 3 and 4 of group development (on which they are more prominent) when compared to stage 2, but not stage 1; again concerning hypothesis 2, results also showed that it is indeed in stage 2 that dominance strategies are more widely used, but statistically significant results were not found when drawing comparisons,

except with stage 4; finally, results didn't point out any statistically significant differences in the usage of nonconfrontational strategies across different group stages. Still in this second study, Dimas (2007) again tried to ascertain whether group development had a moderating effect on the relationship between conflict (task and socio-affective) and performance (operationalized as innovation and efficiency), perceived performance and group satisfaction (hypothesis 10) – which also couldn't be established for the most part, except for innovation, in which group development proved to have a moderating effect when articulated with task conflict. Although the results of this research showed further studies were needed, the author concluded that "conflict emergence is different along group development: indeed, the first moment of group life is characterized by few conflicts, while the second stage is the moment when task and affective conflict are more frequent; until maturity, group development experiences a progressive reduction in conflict" (Dimas, 2007, p. XIII).

Jensen (2008) explored (N = 102) the influence of third-party interventions (e.g., by managers) in intragroup conflict management, by seeking a moderating effect of group development in the relationship between the usage of this type of interventions and group effectiveness. An instrument was created in order to identify what third-party intervention styles were being used in conflict situations. She tested whether for group members currently going through the two earlier stages of group development (stages 1 and 2) using third-party interventions of the inquisitorial style (entailing high process control and high outcome control) would yield noticeably higher levels of group effectiveness. She further tested the same type of interaction, only this time studying the

link between motivational-styled third-party interventions (entailing low process control and low outcome control) and effectiveness, to check if higher levels of effectiveness were attained in groups in the two latter stages of development (stages 3 and 4). While no strong supporting evidence was found for either hypotheses, the analysis of means plots and univariate results allowed her to notice that workgroups were found to show higher performance (one of the dimensions of effectiveness) when high outcome control was enacted from leaders in the two initial stages, whereas low outcome control was associated with higher levels of performance in the two later stages. Groups in the two later stages of development also matched higher effectiveness levels overall.

Guimarães (2009) wanted to find out whether the two components of conflict (task and socio-affective) differed significantly across group development stages in a sample (N = 864) of teams taken from Portuguese organizations (private sector). The hypotheses put under scrutiny were only partially validated, since differences in socio-affective conflict were only found to be statistically significant between stages 2 and 4. This was, however, the most determining conclusion drawn from this research, since all the others analyzed relationships were found to be non-statistically significant: no proof was found that both socio-affective and task conflict are at their lowest in stage 1; as mentioned earlier, stage 2 was only partially confirmed to feature a higher level of conflict than the remaining stages; and it couldn't be ascertained whether conflict was overall higher in stage 3 when comparing to stage 4. Most results – however non-significant – converged with MIDG orientations.

Adopting an interactionist perspective that perceives conflict as a positive thing if managed correctly, Luciana Marques' (2009) research (N = 299) found out that the integrative type of strategies was the most widely used to deal with conflict in all stages except stage 2, when avoidance was the most prominent one. Also, when analyzing for differences specifically in the usage of integrative strategies across stages of group development, these differences were confirmed to yield statistically significant results between stages 2 and 3 and stages 2 and 4. This research wasn't able to confirm, however (as would be predictable under MIDG's orientations) that the use of nonconfrontational strategies was more frequent in stages 1 and 2 when compared to stages 3 and 4. Finally, the last hypothesis proposing dominance strategies to be most frequent in stage 2 comparing to the other stages didn't find conclusive support either, despite the fact that in absolute terms these strategies were indeed more frequent at this stage than in others.

Monteiro (2007) analyzed the interactions between emotions and conflict and tested these two variables for their interdependence in the course of group development. When testing in groups with ongoing conflicts, differences in negative emotions across group development stages were only found to be statistically significant between stages 2 – when they're the highest – and 4 – when they're the lowest. Although both socio-affective and task conflict were found to be more prevalent in stage 2 and less occurring in stage 4, statistically significant differences were only found between these two stages and regarding task conflict specifically. Finally, hypotheses 4 and 5 tested for significant differences between levels of both negative and positive emotions between group development cycles, whenever conflict was extant – statistically significant differences

were only found in relation to negative emotions, which were overall higher in the first cycle of group development (socio-affective) and lower the second one (task).

On Processes Related to Emotions

M. Oliveira (2011) tried to understand how emotional intelligence – conceptualized through Druskat and Wolff's (e.g., 2001) Model of Group Emotional Intelligence – develops over group development stages (N = 332). Contrary to what MIDG would have predicted, the conscience/group's social skills dimension of group emotional intelligence showed statistically significant values only for the comparison between stage 2 (highest of all) and stage 1 (lowest of all), but no statistically significant differences were noted between stage 2 and the second cycle of group development (stages 3 and 4, which were the stages expected to score higher on this). According to the author this can perhaps be explained by the willingness of group members to form alliances in an effort to gain group momentum, which can make them more wary of their emotions as well as other group members'. Concerning the members' group regulation dimension, one would expect it to score lower in stage 2 comparing to all other stages. This was not the case, however: group members were actually found to score higher in this dimension at this stage, specifically when comparing to stage 1 (statistically significant). The author explains this can be due to one of the norms assessed in this dimension of group emotional intelligence being the level of confrontation towards team members who break the rules. One the other hand, this dimension also scores higher in stages 3 and 4, as one would predict considering MIDG's formulations. Concerning group's self-consciousness, no statistically significant differences were found between

stages from the second cycle (3 and 4) and the first cycle (1 and 2) of group development – as was otherwise expected from the model. Finally, group's self-regulation dimension was found to be significantly higher in stage 1 when comparing to both stages 3 and 4 (expectable under MIDG's specifications), but – unexpectedly – even higher in stage 2, which can be due to the fact that teams at this stage are already in a "border" condition, enacting much of the more developed emotions found in later stages of group development.

E. Pinto (2009) based on Barrett and Russell's (1998) circumplex model of affect to frame the role of emotions throughout group development, namely on socio-affective and task subsystems. She tried to find (N = 386) what sort of differences existed across group development stages in regard to expressed, faked and suppressed emotions. She found that negative emotions were more widespread in stage 2 when compared to the stages of the second cycle of group development (stages 3 and 4), but no statistically significant differences were found regarding stage 1. Moreover, results showed that differences in the level of positive emotions were only statistically significant between stages 2 – when they were the highest – and 4 – when they were the lowest. A similar outcome was found relating to emotional suppression, in which significant differences could only be found between stages 1 – when it was the highest – and 4 – when it was the lowest. No statistical significant differences were found regarding emotional faking across group developmental stages. A final, exploratory, research question was raised trying to establish if there was any significant differences in the convergence of emotions as group development unfolds. A significant converging effect was neither found for

positive nor for negative emotions. A second study (Ramalho, 2008) based on the same line of research is referenced in Ramalho, Pinto and Lourenço (2012), tested for similar research questions but focusing instead in an individual level of analysis[12] (*N* = 142). This research didn't find support for the hypothesis that stated that in stage 2 positive emotions are at their lowest of all group development; it did confirm, however, that negative emotions are at their highest in this stage. Again like in E. Pinto (2009), emotional suppression was only found to have statistically significant differences between stages 1 and 4. This study also confirmed that emotional faking is significantly higher in stage 1, but only in relation to stage 4. The Portuguese Job Related Affective Well-Being Scale (Ramalho, Monteiro, Lourenço, & Figueiredo, 2008) – an instrument adapted to Portuguese from the Job Related Affective Well-being Scale (Katwyk, Fox, Spector, & Kelloway, 2000) measuring the occurrence of both positive and negative emotions in workgroups – constitutes one of the main legacies stemming from this research.

Laura Marques (2014) studied the effects of group development on the type of emotions that sportspeople have while playing in teams (*N* = 571). For this intent, she carried on the work of several authors that previously studied emotions framed in the MIDG framework (e.g., Monteiro, 2007; E. Pinto, 2009; N. Pinto, 2012; Ramalho, 2008) and used the tri-factorial instrument produced by N. Pinto (2012) in order to measure group development. The result was the statistically significant establishment of stage 2 as a meaningful predictor of high levels of negative emotions and low levels of positive

[12] E. Pinto (2009) on the other hand did her study on a group level, by aggregating the data collected individually in combined measures.

emotions. Moreover, stage 1 was also established (with statistical significance) to be a meaningful predictor of high levels of positive emotions, but not of low levels of negative emotions. The same thing happened with stage 3/4: it was found to be thoroughly associated to high levels of positive emotions (with statistical significance) but not to low levels of negative emotions.

Other Developments

Rodrigues (2008) associated with MIDG's view on groups – as a group development theorization anchored on a sociotechnical approach – and pondered on the adequacy of whether considering operating room teams (ORTs) in hospitals as systematized groups is advantageous and rigorous towards matching reality. Her study focused on the uniqueness of these teams – given that operating rooms (ORs) are a very particular intersection of various professions taking part in medical procedures (e.g., physicians, nurses, etc.) translating into several different scientific affiliations and schools of thought – and argued whether this view could enhance the prospects of improving their effectiveness[13]. The decision to establish teams as OR's working units' chosen design (encompassing its natural multidisciplinarity) is a widely-recognized benefit to patient care. This research centered, therefore, in checking three key aspects: a) group emergence: to make sure that in the teams considered it was possible to verify groups' three fundamental driving forces, as postulated by MIDG theory; b) group survival and development: to establish whether the impact of a set of previously-

[13] According to the authors there was a need to "study ORT tasks in a detailed fashion, describing and characterizing their dynamics" because health technicians' best work design "may not encompass the formation of groups" (Rodrigues, 2008, p. 17).

identified and potentially vital variables for group continuity had either a positive or a detrimental impact upon group sustainability; and c) group over time: to assess how the passage of time affected the properness and viability of the group. This research embarked on a mixed methodological course – both quantitative and qualitative – and its data was gathered mostly through interviews and direct observation. The multiple studies carried out in the course of this research attested the existence of a sociotechnical structure as predicted by the MIDG (namely, the existence of both the task and socio-affective subsystems). However, when studying the particular component of group effectiveness, not all the effectiveness dimensions predicted by the MIDG emerged, which can be explained by the fact that these teams don't usually have a lasting temporal horizon in sight. On the other hand, throughout the study it was noticeable that respondents tended to highlight aspects related to the task components, and not mention in such great number those linked to socio-affective components; this can also be justifiable by the nature of the teams under consideration. MIDG's basic driving forces were proven to be all present.

Moreira (2007) studied the interaction between mergers and acquisitions in companies and workgroups, relying on MIDG's formulations. In the author's first empirical study ($N = 87$) he predicted tensional forces to erupt in groups as the fusion process unfolds. He found that team members who identify themselves (and for that matter others as well) more with the post-fusion company are better able to perceive aspects related to the development of the group, their issues related to the socio-affective cycle of group development are better resolved and they are more looking forward to

dealing with the task-related aspects of it as well. Therefore, this pattern is identified as propelling group development into later stages – namely those centered on the task subsystem. The study concluded there is usually a gap between how team members and managers perceive the unfolding of group development: managers are both more likely to identify with the new, post-fusion company and tend to perceive the group as being more developed when compared to group members' perceptions. This can be because managers are usually swifter to adhere to the identity of the new company (given that more often than not they're the first ones embarking in newly-appointed positions), and therefore to move past the socio-affective cycle of group development, whereas team members usually take longer dealing with leader dependency issues. A similar phenomenon happens in team members who received promotions integrated in the post-fusion company, and in team members who identified more with post-fusion social categories that pre-fusion ones, hence evincing teams to behave differently according to how tensional forces act upon their boundaries (here again the more developed the group is the better it is able to deal with these tensions, which originate either internally or externally). Moreira (2007) tested similar hypotheses in his second empirical study (N = 98), only this time in relation to acquisitions, yielding similar results. When studying group effectiveness, its factorial structure was also found to slightly differ from Lourenço's (2002) bi-dimensional assertion, although overall confirming it. The results ascertained largely supported a relationship between group development and effectiveness.

Alves (2012) studied teamwork execution interdependence and group socio-affective interdependence with the intention of realizing how both relate to group effectiveness, within MIDG specifications. Through the development of a new instrument intended to measure socio-affective interdependence in groups, the author was able to ascertain its multidimensional nature – relational closeness, work-related emotionality and open expression were the emerging dimensions. In her second study (N = 491), different mediating effects were found to be extant between the three emerging socio-affective interdependence variables and the different dimensions of teamwork execution interdependence (tasks, results and functions) and group effectiveness (group satisfaction and performance). Furthermore, group development was found to enact significant moderating influence on the association between both teamwork execution interdependence and group effectiveness and socio-affective interdependence and again group effectiveness, and the most prominent disparities happened to emerge between stages 2 and 4, specifically between results interdependence (a dimension of teamwork execution interdependence) and group satisfaction (a dimension of group effectiveness) and between relational closeness (an emerging dimension of socio-affective interdependence) and again group satisfaction. As main contributions deriving from this research, Alves (2012) pointed the theoretical framing of socio-affective interdependence as a group process – corroborated empirically; the development of the teamwork execution interdependence construct (introducing the function interdependence dimension, which proved to be the most pervious to the effects of socio-affective interdependence); and the overall support for the MIDG, to which the main conclusions

derived from this research can be framed fittingly – stage 4 gets out reinforced as pertaining to a high level of effectiveness, both task as socio-affective wise; and stages 2 and 4 are further consubstantiated as featuring fundamental differences between them.

N. Pinto (2012) tried to understand the link between behavioral patterns of sport coaches and group development in terms of the consequences they can have on the performance and satisfaction of teams. For that end, he developed an instrument aimed at measuring group development specifically on sports teams (EDG-D, explored in greater detail in the next section) and subsequently tried to establish how the referred interactions affected social, affective and task effectiveness along a sports season (longitudinal design; the author used the same sample we're resorting to in the present research). Firstly, it wasn't proved that having a leadership style suitable to the current stage of group development had an effect – positive or otherwise – in either group satisfaction, performance or goal attainment. It was found, however, that groups in stage 3/4 where such fit existed would benefit from an additional "maintenance effect" (meaning it would favor teams not to regress into earlier stages). Between *t1* (in the beginning of the sports season) and *t2* (in its end) most of the teams were seen progressing in group development, but it couldn't be proved that enacting a leadership style matching the team's current stage of development had a significant impact in favoring the team's transition into later stages of group development. Since these results don't support the MIDG, the author argues that maybe other factors related to the behavior of leaders have the effect of favoring group's transition into later stages, and not necessarily their

leadership style specifically[14]; MIDG itself doesn't perceive matching leadership styles as a sine qua non condition for group development to occur. Moreover, this research established a positive relationship between the fit in leadership style/group development stage and goal attainment (except for stage 2), but failed to do so with group performance. Nevertheless, this corroborates the effect of the aforementioned fit on task effectiveness, specifically in stages 1 and 3/4 – hence, also supporting MIDG. Finally, by drawing comparisons between the levels of group satisfaction, group performance and goal attainment, significant differences were found among groups going through differing developmental stages – as expected, stage 3/4 showed the highest levels overall, and stage 2 the lowest[15]. Coaches also tend to perceive team performance as being higher in teams in the final developmental stage, and lower in the second stage. The conclusions ascertained were overall convergent with previous research.

Luís Marques (2010) adapted EDG-D so that it could be suitable for deployment in workgroups. In order to study its psychometric attributes, factorial validity, reliability and concurrent validity were analyzed (N = 333). The concurrent validity section of the construct validation was done by resorting to a series of other instruments also related to MIDG. As we are going to expose in the following sections, this instrument's emerging structure was tri-factorial, which doesn't strictly comply with MIDG specifications but does have interpretability in the light of the model.

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[14] This supposition is based on the fact that most (77.78%) of coaches were found to be enacting a leadership style matching the current stage of group development. Another explanation for this – possibly fortuitous – match could be (since over 80% of the teams in which there was an alignment were in stage 1) a general tendency for coaches to feature a directive leadership style and not be willing or capable of progressing into different styles.

[15] Even if not statistically significant for the relationship with goal attainment.

Silva (2007) contributed to the model by developing an instrument aimed at appraising the four distinct leadership styles envisioned by it – structuring, transformative, guiding and interactive. Within the MIDG framework, leaders are expected to adapt their leadership style to the specifications of each stage of group development, as means of propelling the evolution of the group, from stages characterized by a higher dependence towards the leader and less maturity overall to stages where greater maturity and interdependence among team members can be found. This way, the leader is supposed to complement the group in the subsystem in which group's mastery is less noticeable at a given moment of its development – the leader should, therefore, focus on assisting the team in the scope of the task subsystem for the duration of the first cycle (stages 1 and 2) and on helping in socio-affective-related matters in the second cycle (stages 3 and 4) of the group development process. The author carried out an exploratory research (N = 159) with the aim of developing the instrument and render it capable of measuring such leadership styles. By presenting respondents with specific statements from which they were supposed to pick one, this instrument measured what the author considered to be the 9 aspects of leadership worth measuring according to MIDG specifications – communication processes; decision-making; conflict management; goal setting; rules setting and instruction; role clarity; planning and organization; climate; and resources management. Although conceptualized in a single-factor architecture, it was found to discriminate the four leadership styles, hence supporting MIDG's considerations regarding them.

A. Pinto (2014) tried (*N* = 2400) to enhance the understanding of how knowledge management processes interacts with group development and what sort of combined effect do they have upon group effectiveness (task and social-affective). In her first two hypotheses she tested for differences in the level of usage of knowledge management processes across group development stages: as expected within the MIDG framework, stage 3/4 proved to be the moment of group development in which knowledge management processes are more widely used, whereas it is in stage 2 that they're less used overall – it is also noticeable that most knowledge management processes have a content that highly relates to group processes (the intentional sharing and dissemination process is the one in which usage differences are more substantial; automatic recovery on the other hand is the process in which differences are less noticeable across group development stages). The second two hypotheses tested for differences in task and socio-affective effectiveness (as perceived by leaders) across group development stages. No significant differences were found across stages for task-effectiveness – it is consistently appraised as high, which can be due to social desirability phenomena. Stage 3/4 was consistently found to be the stage when socio-affective effectiveness was higher, and stage 2 when it was lower – even if results were not statistically significant when comparing stages 2 and 1, which can be at least partially attributed to the characteristics of the sample (cf. next section for more details). Finally, team knowledge management processes proved to have a partial but significant mediation effect in the relationship between group development and group effectiveness – which means that both group development (through means of propelling development into stage 3/4) and team

knowledge management processes can be manipulated in order to attain increased group effectiveness. Differences in the mediation effect are not significant between stages, and "use of knowledge" was found to be the most beneficial team knowledge management process.

Using samples of sportspeople and coaches, J. Oliveira (2012) tried to contribute to the understanding of group development theory by undertaking a series of empirical studies of a methodological nature. In the course of his work, he tried to frame group development within the broader scope of the study of groups, seeking relevant contributions from recent literature to better describe the group processes involved – among them, those related to the stages and sequentiality of group development. Throughout his research several empirical studies (both exploratory and confirmatory) were carried out with the aim of constructing and validating group development instruments and ascertain what factorial structure would fit them the best. As a basis for J. Oliveira's (2012) dissertation, several group development models were considered, including integrated models – in which MIDG is included.

Peralta (2009) wanted to enhance the knowledge about group development by putting to the test some of the fundamental aspects contained in Miguez & Lourenço's (2001) theory, as an integrated model of group development. As a first study (N = 563), the author developed and tested the psychometric qualities of a couple of Likert-scaled instruments aimed at assessing the current stage of group development, one of them focusing on the socio-affective subsystem of the MIDG, and the other one on its task subsystem. Both exploratory and confirmatory procedures were undertaken, and a tetra-

factorial model yielded positive results overall, for both the socio-affective and task subscales. These results were further reinforced through the checking of the instruments' convergent validity against PDE. In his second empirical study (in which he relied upon the same sample) his findings pointed to the data thoroughly adjusting a conception of group development that's two-dimensional – meaning both socio-affective and task subsystems should be accounted for – concerning states 1 and 4, and unidimensional – meaning both subsystems should be regarded as a unified dimension – concerning stages 2 and 3[16]. Finally, the last exploratory procedures allowed him to conclude that groups follow a developmental pattern supporting an integrated approach on group development[17] and that earlier stages of group development have a direct as well as indirect impact on stages of greater maturity – the author highlights the influence that a high level of conflict taking place at stage 2 may have in the ability of groups to progress into stages 3 and 4, and the influence that a comprehensive role and goal bargaining at stage 3 may have in generating increased prospects of reaching and staying in stage 4.

Finally, Araújo (2011) undertook the effort of mapping all the group processes (e.g., communication, conflict, negotiation, leadership, decision-making and effectiveness) involved in the development of groups and that are scattered across literature, as means to justify the integration of these processes in the MIDG framework.

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[16] And, thus, contradicting the conclusions drawable from the first empirical study, where correlations between factors pointed in the direction of two independent dimensions, task and socio-effective, even for stages 2 and 3. These findings are also consistent with influences from polar models, given the noticeable tension between the tendency towards fusion in stages 2 and 3 and interdependency in stage 1 and 4.

[17] And, thus, one that comprises elements from the linear, cyclical and polar types of models, as well as Gersick's (1988) punctuated equilibrium model.

Chapter 4: The Group Development Scale – Sport (EDG-D)

Developed by N. Pinto in 2009 during his doctoral research[18] the Group Development Scale – Sport (EDG-D)[19], anchored in the MIDG framework, is an instrument to measure the group development. Originally built to use in Sports Teams, EDG-D was afterwards adapted to work teams by Luís Marques (2010) and, also, by A. Pinto (2014). The early version of the instrument accounted for the measurement of a set of 36 items assembled into 9 categories. Later on, a revised version was conceived, constituted by a total of 34 items. Luís Marques' version accounted for a set of 23 items and A. Pinto's version includes 25 items – both of them integrating the same number of categories.

These 9 categories refer to a set of different group processes N. Pinto considered relevant in assessing group development status, in accordance to the MIDG (cf. N. Pinto, 2012). These group processes are as follows: communication as a participation type; conflict and conflict management; subgroup existence; group cohesiveness; decision-making processes; norms regulating team's functioning; team members' roles; defining team's objectives; and managing differences among team members. Within the scope of each of the categories, four items were devised to assess a different stage of group development. Each item is measured through a 7-point Likert scale, worded as being "applicable" to a certain degree, from "1-Not applicable" to "7-Totally applicable".

N. Pinto (2012) clarifies that the aim of EDG-D was to assess group development through a scale format, instead of doing so, as in PDE, based in a set of scenarios. The

[18] Concluded in 2012.
[19] In Portuguese: *Escala de Desenvolvimento Grupal – Desporto* (EDG-D).

advantages involved in using ordinal scales – e.g., Likert – over nominal ones – e.g., statement/scenario picking – are outlined by numerous authors (e.g., Coaley, 2010; Hair et al., 2010; Hill & Hill, 2002; Nunnally & Bernstein, 1994). Nunnally and Bernstein (1994) even goes to state that "nominal scales have thus far offered little to formal scaling models" (p. 12).

Ordinal scales represent different amounts of an attribute being measured (even if not benefiting from interval properties, as is the case in metric measurement scales), whereas nominally-devised data can only convey a class or category of affiliation. The ordinal type allows for a ranking of the data obtained (Hair et al., 2010; Hill & Hill, 2002; Nunnally & Bernstein, 1994); nominal scales, in the other hand, "have no quantitative meaning beyond indicating the presence or absence of the attribute or characteristic under investigation" (Hair et al., 2010, p. 5). Coaley (2010) adds that ordinal scales "provide a more precise level of measurement than nominal scales" (p. 27); at the same time, this author also pinpoints a number of disadvantages associated with nominal scales: the lacking of quantitative comparability; the inability to ascertain the amount of difference between categories; and the incapability of eliciting analysis regarding anything aside from frequency.

Scales comprised by items sorted as ranked, non-absolute scores (e.g., Likert scales) are adequate to measure subjective phenomena, such as the intensity of feelings (Nunnally & Bernstein, 1994) and overall these scales generate more information on individual differences and attributes. Furthermore, rank ordering is one of the fundamental features of higher level measurement scales.

Regarding PDE in particular, we should flag some of the instrument's limitations: the passage across developmental stages is perceived as one of a qualitative nature, hence disallowing the independent appraisal (e.g., quantitative) of their single components; by identifying a developmental stage, group members are proclaiming their unconditional adherence to that choice; it doesn't allow for any notions of continuity or ranking across stages (e.g., Miguez & Lourenço, 2001, 2002). In contrast, Likert scales such as the one used in EDG-D enable us to lessen the chance of inducing respondents into perceiving a generalist-themed scenario (hence reducing the risk of generating social desirability); it allows us to deconstruct group development into its concomitant processes according to the theoretical framework it is anchored on, giving way to the building of latent variables and allowing for a more independent and refined analysis of the construct; and finally, it permits us to render more robust validation (e.g., Coaley, 2010; Kothari, 2004; Nunnally & Bernstein, 1994).

N. Pinto (2012) emphasizes that, as we already referred, in the studies using PDE (e.g., Dimas, 2007; N. Pinto, 2012) the respondents tend to perceive phases 1 and 2 as negative, as opposed to the preferable, more evolved third and fourth stages, resulting in a dominance of favorable responses relating to the two latter stages - an issue EDG-D seeks to avoid. Also, the aim of this instrument was, from the beginning, to address the sport environment; therefore, only sports teams were used while trying to validate its psychometric capabilities.

The author's seminal study (N. Pinto, 2012) revealed that EDG captures only three of the four stages proposed by MIDG, joining the items of phases three and four

into a single factor. The scale performed very well on its reliability assessment displaying very good internal consistency values: the first factor (corresponding to the Restructuring/Realization combined stage) scored $\alpha = .95$, the second factor (corresponding to the Reframing stage) scored $\alpha = .95$, and the third factor (Structuring stage) scored $\alpha = .93$.

Beginnings

In its early versions[20], EDG-D was originally a set of 60 items distributed into 15 categories (4 items each) arisen from a content analysis on group development and its array of relevant processes. Each of the items were aimed at measuring a certain group process relating to a specific group development stage, and thus all of the four developmental stages comprised in MIDG were assessed in all categories of group development processes. Since the instrument's envisioned population target was characterized by highly diversified educational levels, all sentences were formulated in their affirmative form, and using a clear and unelaborated language. The items were also written considering the sports field. In the content validity studies, the instrument was analyzed by a panel of academic experts (including the authors of the MIDG), and was object of a preliminary application in a pilot study with a sample of 17 sportspeople (members of collective sports teams). Those procedures led to changes in the wording of some items, allowed for the final form of the instrument to be defined (Likert scale), and led to the reduction of the number of items and categories to be included (some categories were found to be nonessential, mostly on the basis of being redundant).

[20] Fully detailed in N. Pinto's (2012) chapter five.

Therefore, the final version of the EDG-D, afterwards submitted to construct validity studies, included 36 items measured through a 7-point Likert scale, distributed by 9 categories (those aforementioned) considered the most discriminative when relating to the conceptual foundations of the MIDG (N. Pinto, 2012).

During its construct analysis (namely, dimensionality studies), with a sample of 440 subjects from 34 sports teams, N. Pinto (2012) submitted the scale to a principal components analysis. The results, as we already said, showed a three dimensional structure. The items relating to stages 3 and 4 had been grouped together into a single factor (first factor), explaining 27.50% of variance. The items built to measure the second stage grouped in the second factor (20.30% of variance) and the items related to the first stage grouped in the third factor (17.50% of variance). The first factor included 16 items (two items were dropped, as they saturated in two factors), the second factor included 9 items and the third factor also comprised 9 items. The loadings ranged from .58 to .81 in the first factor, from .77 to .85 in the second factor and from .65 to .80 in the third factor.

The reliability analysis of the scale, namely the internal consistency, revealed Cronbach's alpha values ranging from .93 (for third factor) to .95 (first and second factors).

N. Pinto also (2012) tested the convergent validity[21] of EDG-D against PDE, concluding that EDG-D's capabilities on discriminating the level of group development are adequate[22].

[21] Cook & Campbell (1979) summarize the convergent validity analysis in two main stages: a) the first one should test for the convergence among distinct instruments that nonetheless try to assess the same

Besides confirming the instrument's good fitting to MIDG specifications, the results of N. Pinto's studies showed EDG-D's psychometric capabilities, and its status as a valid instrument to be readily used from that point onwards, even considering the downside of it being unable to differentiate between stages 3 and 4 of the MIDG. N. Pinto (2012) asserts this is due to the difficulty there is in clearly differentiating between these two final stages – including on theoretical grounds, which even its original authors acknowledge. Most of the variances in the way group members express themselves in these final stages seem to have more to do with aspects of intensity and frequency than quality (N. Pinto, 2012, p. 186).

It is important to add that N. Pinto (2012) developed a second study – that resorted to the same sample we're presently using in this study, given that back then the authors assessed the instrument's reliability only and not its construct validity – also, in that study, EDG-D (which was applied twice – *t1* and *t2*) revealed adequate internal consistency indicators (values for *t1*: stage 1 $\alpha = .94$, stage 2 $\alpha = .95$ and stage 3/4 $\alpha = .94$; and for *t2*: stage 1 $\alpha = .95$, stage 2 $\alpha = .96$ and stage 3/4 $\alpha = .96$). Correlations between each item and its corresponding dimension were also good, ranging from .54 to .87 for *t1* and from .68 to .90 for *t2*, allowing his author to conclude the scale was not carrying expendable items, since alpha values didn't increase, should a certain item be deleted.

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construct; b) in a second instance, divergence between instruments that aim at conceptual grounds sharing a fair amount of relatedness but that otherwise are distinct constructs should be tested.

[22] In this validation process, the used sample had a size of $n = 439$, well above the one hundred minimum threshold set by multiple authors (e.g., Bryman & Cramer, 2001; Gorsuch, 1983), and was therefore rendered usable for subsequent factorial analysis.

For the scope of this study, considering our objectives (cf. “Objectives” section) we use N. Pinto's (2012) initial version of the instrument comprising 36 items (cf. appendix A for complete instrument).

Later Subsequent Developments

In Luís Marques (2010) the original EDG-D instrument from N. Pinto (2012) had to be adapted in order to be adequate for usage in work teams (the original was intended for usage in sports teams only). Some linguistic adjustments had to be accommodated. Subsequently, those adjustments were submitted to a panel of academic experts for further suggestions and improvements to the instrument, so that it would be properly validated. On the statistical construct validation studies performed through principal components analysis, as in the original study of N. Pinto (2012) the items associated with stages 3 and 4 clustered into a single factor. Therefore, items were grouped together into the same three factors as they did in N. Pinto's study, namely: factor one, corresponding to MIDG's stages three and four combined (Restructuring/Realization); factor two, related to stage two (Reframing); and factor three, concerning stage one (Structuring). Thirteen items were discarded from the questionnaire due to saturation issues. Thus, Luís Marques' (2010) version of the instrument includes 23 items distributed over the same 9 categories proposed by N. Pinto (2012): 13 of those items amounted to factor 1 (Restructuring/Realization stage, which explained 28.13% of variance); 6 items were part of factor 2 (Reframing stage, explaining 17.37% of variance); and the remaining 4 items made part of factor 3 (Structuring stage, amounting for 9.41 of variance). This research also provided further reinforcement to the instrument, as it too reflected adequate

reliability patterns: α = .68 for Structuring phase, α= .87 for Reframing, and α = .92 for Restructuring/Realization stage. Convergent validity analysis was also favorable. This study was based on a sample of 333 subjects, from 74 work teams. Data was gathered in organizations whose operations heavily relied on team work, but sampling was done on the basis of resorting to the researcher's own network of acquaintances, which is a practice that is known for encompassing obvious limitations concerning generalizability of its conclusions to a broader, universal population (Hill & Hill, 2002).

Based on Luís Marques' (2010) reformulated version of EDG-D – which was named EDG[23], and was aimed at work environments, as stated above – A. Pinto (2014) tried to address the previously-identified difficulty on discerning phases three and four of the group development model[24]. This way, the author proceeded to linguistic modifications on some of the items in an attempt to make them "more clear and concise, with the final goal of differentiating them" (p. 197). Considering that stage three marks the beginning of a new developmental cycle, when group members start looking for "readjustment", A. Pinto (2014) changed some of the items' phrasing in an attempt to emphasize the idea that "team members start to...", while in items corresponding to phase four the intended result was to track team's developmental maturity attributes more thoroughly. Twelve items in total were rewritten, seven relating to stage three, and five to stage four. The resulting wording of the twelve rephrased items was analyzed by a panel

[23] Group Development Scale; in Portuguese's original phrasing, *Escala de Desenvolvimento Grupal* (EDG).
[24] For that end, A. Pinto (2014) borrowed Luís Marques' (2010) initial array of 36 items, and not the final, 23-item version of the instrument, which was the result of the instrument's validation process.

of experts. Seven items related to stage three and 5 to stage four – totaling 12 items – were proposed a different formulation.

EDG's validation process comprised two distinct procedures addressing the assessment of its psychometric qualities: a first one, encompassing a dimensional study done through an exploratory factorial technique, principal components analysis, along with its corresponding reliability study; and a second one, comprising a similar process, but doing a confirmatory factorial analysis instead, again coupled with a reliability check.

In the first analysis, as a sample, the authors picked 644 random participants out of the larger version of their participants' database, consisting of 2174 Portuguese military-police officers[25], members of 210 groups, and thus amounting to about 30% of the whole research sample. Their commanding officers were not considered through the course of the analysis, and therefore kept outside of this sample's scope. As observed in previous research (Luís Marques, 2010; N. Pinto, 2012), items related to stages three and four grouped together again in a single factor, and a three dimensional structure emerged once more. Nine items had to be dropped due mostly to failing to achieve the minimum threshold of acceptability related to the communality analysis; an additional two items were discarded mostly on the grounds that they saturated into a different factor than they were supposed to. Finally, EDG was left with 25 well-grounded items. In spite of the items being unevenly distributed across group development stages (Structuring stage included 3 items, Reframing 8 items, and Restructuring/Realization stage was comprised

[25] The National Republican Guard (in Portuguese, *Guarda Nacional Republicana* – GNR) is Portuguese's gendarmerie and thus one of the major security forces in Portugal, accountable for law enforcement throughout Portuguese territory, notably serving in the countryside and some of the country's less densely-populated areas. Being a military force, it is subject to military law and regulations.

by 9 items), authors chose to still regard the scale as an adequate instrument, since it had undergone extensive validation. Reliability analysis revealed good to very good Cronbach's alpha values among the factors: α = .94 for Restructuring/Realization stage, α = .90 for Reframing, and α = .65 for Structuring.

The procedure consisting of the second analysis resorted to the 25-item instrument resulting from the exploratory procedure. The authors used the remainder of the available sample – 1530 research participants, or 70% of the whole sample – in order to proceed with the confirmatory factorial analysis. They picked the "Maximum Likelihood" estimation method, widely used in the structural equation modeling arena. All criteria for results to be rendered admissible as defined by Brown (2006) and Kline (2011) were met with either acceptable or good levels[26], and all the items presented factor loadings greater than .45, in compliance with the admissibility threshold set by Tabachnick and Fidell (2007)[27]. Stages one and two correlated positively (r = .38) – in opposition to what could be theoretically predicted based on several diverging characteristics found in both phases. This can be explained by the fact of both stages integrating the same MIDG cycle – the socio-affective cycle, on which the socio-affective subsystem plays a dominant role. Stages one and three/four showed a weak positive correlation (r = .17), explainable on the grounds that some key aspects overlap to a certain point in both of these stages, namely those concerned with group's high

[26] $\chi^2_{(272)}$ = 1495.30, p < 0,001; Standardized Root Mean Square Residual (SRMR) = .04; Root Mean Square Error of Approximation (RMSEA) = .05; Comparative Fit Index (CFI) = .94; Tucker-Lewis Index (TLI) = .93 (A. Pinto, 2014, p. 208).

[27] These authors classify factor loadings as follows: above .71 are excellent, .63 very good, .55 good, .45 fair and .32 means poor.

cohesiveness and overall sense of harmony[28]. Finally, stages two and three/four had a robust negative correlation (r = -.49), and this can be justified chiefly on the account that: a) these stages are part of different MIDG cycles – stage two makes part of the socio-affective cycle, on which the socio-affective subsystem is stronger, while stage three/four is affected by a stronger prominence from the task subsystem; b) they relate to distinct mood settings – in stage two it is expectable for the group to have a sense of tension and protest whereas in stage three/four groups are expected to sail on a sea of trust and cooperation; c) in stage two a strong opposition towards subgroups' formation is supposed to be extant, whereas in stage three/four such structures should be accepted and encouraged; and d) in earlier group development stages decision-making is done resorting to (preferably) neutral/formal procedures – e.g., voting – whereas decisions tend to be consensual in later stages. Reliability again was strong, with comparable results to those seen in the exploratory study: α = .68 for Structuring stage, α = .91 for Reframing, and α = .93 for Restructuring/Realization.

Laura Marques (2014) also relied upon the EDG-D to assess group development on sports teams (cf. prior section). The 34-item version derived from N. Pinto's (2012) study was used, again attaining strong internal consistency results – Structuring stage: α = .90; Reframing stage: α = .93; Restructuring/Realization stage: α = .95.

[28] Moreover, this can explain why some people tend to mistakenly link groups to later stages of group development – i.e., greater maturity – when they're actually located in the earlier stages instead (A. Pinto, 2014).

Chapter 5: Objectives

Construct validation studies carried out by N. Pinto (2012) unveiled a three-stage dimension scale, bringing to question the fit between EDG-D and the original MIDG model conceptualization.

As previously discussed, past adaptations of EDG-D to non-sports teams also ended up not complying with MIDG's original four-stage model. Considering all this, the main objective of this study is to address the extension of the validation of the instrument's construct. We are going to confront the theoretical structure of four stages with N. Pinto's (2012) emerging factorial structure (three three-dimensional). Additionally, considering that the data were collected in the same sample at two different times, we are going to analyze the measurement invariance.

Chapter 6: Methodology

Following Drenth's (1998) guidelines, this study can be included in the *instrumental* research, in which we try to confirm the instrument's quality and assess to what extent we can trust the results produced by it. According to the referred author, instrument's subsequent accuracy on collected data depends on the fulfillment of this step.

This study is of a quantitative nature, and features a basic longitudinal design, made up of two main observational moments: the first one taking place at the beginning of the sports season, and the last one on its end – which can be referred to as *t1* and *t2*, respectively. All of EDG-D's answering data was inquired and gathered directly from the members of the groups studied.

We use a sample of 54 sports teams (N = 566) to assess which one of the concurring conceptualizations of the instrument (whether a 3-stage or 4-stage model) better fits the data. In order to do so the study goes through a 2-step analysis: a) we go through a specific type of structural equation modeling (SEM) – confirmatory factor analysis (CFA) – to check which one of the mentioned alternatives conveys the better explanation of the team development instrument; b) since EDG-D was applied to the same sample in two separate moments – the beginning and the end of sports season (a matter we are going to approach in greater depth in the data collection section) – we are going to proceed to the measurement invariance analysis as means of assessing the stability of the factorial structure, which will therefore allow us to rely on a more robust

measure when compared to the most widely used test-retest procedure[29] (e.g., Bond et al, 2011; Chen & Tang, 2006; Kim, Cramond, & Bandalos, 2006; Richardson, Ratner, & Zumbo, 2007).

Sample and Data Collection

The data were collected by N. Pinto (2012) in a sample of 54 handball, basketball, futsal, roller hockey, and volleyball teams. Teams were between 8 and 15 members in size (M = 10.48, SD = 2.03). The minimum age recorded was 16 and the maximum was 41 (M = 24.27, SD = 4.55). Members' tenure in the team ranged from 1 to 14 seasons (M = 2.61, SD = 2.05). This sort of sports teams match group specifications set forth by MIDG: groups being considered as social systems whose members interact on a regular basis; group members bearing an interdependent behavior strand; and existence of at least one common, bonding objective among group members.

All teams considered were based in continental Portugal or the Azores autonomous region, and competed in the 2009/2010 sports season. They were all senior teams, competing both at national and/or international level.

[29] Test-retest is one of the most widely used methods to assess reliability, and its main aim is to evaluate the stability that scores obtained in the scope of a certain instrument are able to maintain over time; fundamentally, it compares the same measure in two different moments (e.g., Hendrickson, Massey, & Cronan, 1993; Kwon & Trail, 2005). However, for quite some time now researchers have been aware of a number of its limitations, namely the difficulty it shows when handling instruments/measures that are expected to vary over time – as it is the case with those involved in the measuring of group development – as well as in establishing standard specifications regarding the time gap it is recommended to wait between assessments, and cutoff points involved in the application of this technique (e.g., Heise, 1969; Netemeyer, Bearden, & Sharma, 2003; Nunnally & Bernstein, 1994). Since EDG-D is a developmental scale, we shouldn't assume scores attained by respondents to be the same across time, since respondents are supposed to achieve different scores depending on the group development stage they're presently at. Therefore, we should focus instead in making sure that factor structure (e.g., relationships between latent variables, factor weights, and item correlations) of the scale remains intact over time (i.e., invariant).

Considering the distribution of players, roughly two thirds (67.68%) of the sample were male. As for the education level among participants in this study, again over two thirds (69.08%) of the players featured education bellow college-grade level. Handball is the most practiced sport by sample subjects, followed by volleyball; basketball is the least practiced sport (cf. table 1).

Table 1

Participants' distribution concerning gender, players' educational qualifications and sport (N = 566; 100.00%).

Sociodemographic criteria	*N*	%
Gender		
Male	383	67.67
Female	183	32.33
Players' educational qualifications		
Basic education[30]	65	11.48
Secondary education[31]	326	57.60
Higher education[32]	175	30.92
Sport		
Handball	159	28.09
Basketball	44	7.77
Roller Hockey	84	14.84
Futsal	133	23.50
Volleyball	146	25.80

[30] In accordance to Portugal's classification, comprising the educational path up to 9th grade, which corresponds to the level 2 in UNESCO's International Standard Classification of Education system (ISCED), the same as in the European Qualifications Framework (EQF). At the time of the collection of the data, this was the compulsory level of education.
[31] Corresponding to levels 3, 4 and 5 in ISCED, the same as in EQF (up to 12nd grade).
[32] Beginning in level 6 according to ISCED, the same as in EQF.

The same happens considering teams, handball and volleyball only switching positions – volleyball has the most teams, closely followed by handball. Basketball is also the sporting discipline with the fewest teams in our sample (cf. table 2).

Table 2

Teams' distribution according to gender and sport (N = 54; 100.00%).

Criteria	*N*	%
Team gender		
Male	35	64.81
Female	19	35.19
Sport		
Handball	14	25.93
Basketball	5	9.26
Roller hockey	9	16.67
Futsal	11	20.37
Volleyball	15	27.78

Many of the sportspeople considered in our sample are amateur, and are therefore not paid: out of the 566 players considered, this is the case for 204 of them (36.04%). There are also those who get some retribution but it's not their main source of income (136 players, or 24.03%), and those whose main source is the considered activity (*n* = 226; 39.93%) – in total, 362 of the players (63.96%) of the considered sample get paid to a certain level.

The process of collecting the data comprised sending a presentation letter to several sports teams, explaining the study's scope and asking them about their interest in participating in this research. Those teams were picked from the lists that were gathered

from the various sporting disciplines national federations' websites. About a week later, teams were to be contacted to check if they received the letter and if they were willing to participate in the study. Only senior teams were considered; the type of competition they were playing at – either local, national or international – was disregarded. Participation rate was about half (45%). During the course of data collection researchers found out that most sports teams presented considerable resistance to participating in the study, mostly due to being afraid of losing secrecy over key information concerning their teams. Participating teams were requested to answer the surveys twice along the sports season of the main competition they were playing at: firstly (*t1*), sometime between the first and the fifth game of the sports season; and secondly (*t2*), sometime between a week prior to the occurrence of season's last game and one week after it took place. The instruments were applied to the respondents on-site by N. Pinto (2012) at their training venues[33], where they were duly informed about the study's specifications. Average responding time was 16 minutes and 48 seconds.

Instruments

In the scope of this study, we focus on EDG-D, an instruments intended to measure group development on sports teams. The original version of the instrument was comprised by 36 items, distributed among 9 categories, each corresponding to a relevant group process in accordance to MIDG. These categories are as follows: communication as a participation type; conflict and conflict management; subgroup existence; group

[33] Except for 12 of the participating teams, which requested to hold the questionnaires so that they could answer them latter on and mail them back to the researchers once they were done responding (N. Pinto, 2012, p. 225).

cohesiveness; decision-making processes; norms regulating team's functioning; team members' roles; defining team's objectives; and managing differences among team members. Every category has 4 items associated to it, each one describing the scope of that particular group process in relation to the 4 developmental stages predicted by MIDG. Each item is measured through a 7-point Likert scale.

The validation of this instrument constitutes de main aim of this study – we intend to carry on the work of other authors (e.g., N. Pinto, 2012) for that matter. The instrument – as well as all its past developments, alternative versions, and validation efforts – are thoroughly detailed in the previous section of this text (cf. "The Group Development Scale – Sport [EDG-D]" section).

Statistical and Methodological Procedures

Considering the objectives of this research and in order to assess the plausibility of the models hypothesized, we conducted a series of confirmatory factor analyzes (CFA), which constitutes a stripped down version of Structured Equation Modeling (SEM)[34]. The general aim of this method is to confirm the fitting of the data according to a theoretical model previously established. Since all the data was gathered in two distinct time stamps – *t1* and *t2*, as we've already discussed in the "Methodology" section – we used the data collected a *t1* to test the four-dimensional conceptual model against the three-dimensional emergent model (based on the original study of N. Pinto, 2012). With

[34] CFA assesses the goodness of fit between a specific set of measures and its construct, without aiming at establishing relationships among several constructs – also called *latent variables* – as is the case in SEM (Hair et al., 2010).

this procedure we elected the model that better fits the observed data and, then, with the data collected at *t2*, we tested the model invariance.

A previous analysis to measurement's assumptions as well as an outliers' checking allowed us to carry on into proceeding to the confirmatory factor analyses. We performed them using the maximum likelihood method – which is a parametric method – one of the most widely used and recommended (e.g., Kline, 2011). In order to assess the goodness of fit of the proposed models we based our decision on chi-square tests and some other goodness of fit indices. We are basing our review mostly on Brown's (2006) and Harrington's (2008) assertion of three adjustment index categories: a) absolute fit indices; b) parsimony correction indices; and c) comparative fit indices. The first one relates to the assessment of whether the residual variance is dismissible or otherwise significant; this analysis is based on chi-square (χ^2) to ascertain if the model composed by the empirical data adjusts itself to the theoretical model. Since chi-square is known to suffer greatly from differences in sample size (Byrne, 2010) we're supporting our decision about the level of adjustment of our model through the conjunction of the fit indexes. Besides chi-square, Standardized Root Mean Square Residual (SRMR) is also used as an absolute index measure, by calculating the average difference between the covariances from the input data and the one predicted by model's theoretical framework. Parsimony correction indices relate mainly to Root Mean Square Error of Approximation (RMSEA), which addresses the question of whether the model keeps as a simple structure as possible. Penalizing complexity, RMSEA is, however, less dependent on the sample size. Finally, comparative fit indices concern mostly Comparative Fit Index (CFI),

Tucker-Lewis Index (TLI) and non-normed fit index (NNFI), all measures designed to evaluate the fit of a given model against a more restricted, simpler model, considered only on comparative grounds.

The thresholds of validity accepted were based on Brown (2006) and also on Kline (2011): Brown (2006) considers RMSEA values adequate if equal or less than .08; SRMR if equal or less than .08; and CFI acceptable if over .90 and adequate if close to or over .95. Reference values set by Kline (2011) are: RMSEA values are best if equal or below.05, if between .05 and .08 it means there is some approximation error, and values above .10 mean a poor fit is in place; CFI values above .90 should be regarded as a sign of a good fit; and SRMR values of less than .10 point to a good fit of the model. Both Brown (2006) and Kline (2011) suggest the importance of analyzing the "chi-square, RMSEA, the 90% confidence interval, and the SRMR" in a duly manner to assess the goodness of fit of the desired model (A. Pinto, 2014).

In order to assess the instrument's reliability – namely its internal consistency – we used Cronbach's Alpha value. Reference values used were those of Nunnally and Bernstein (1994) that set .70 as an acceptable threshold for newly-developed instruments – particularly if we're dealing with instruments aimed at assessing group dimensions – whereas higher values beginning at .90 (standard should be placed at .95 in normal conditions) are deemed necessary if we're dealing with the assessment of individuals, especially if "important decisions are made with respect to specific test scores" (Nunnally & Bernstein, 1994, p. 265).

Prior to the dimensionality and reliability studies, we undertook some preliminary analysis on missing values. As a first step, we focused on finding relevant participants or items with an excessive amount of missing data that according to Hair et al. (2010) should be set to a 10% threshold. No single participant was found to omit more that 10% of his/her query's responses; therefore, none of them were discarded from the sample on those grounds. Subsequently, we proceeded to the missing data's distribution analysis, aiming at verifying whether it was found to be completely randomized or not. For that purpose we used Little's (1988) MCAR (*Missing Completely At Random*) test. Once the distribution was found to be non-random[35], we proceeded to the replacement of missing values according to the EM (*Expectation Maximization*) algorithm method (Hair et al., 2010).

All data analyzes were performed on IBM's *Statistical Package for the Social Sciences* (SPSS, v22.0) and IBM's SPSS Amos (v22.0; Arbuckle, 2013). SPSS was used to perform internal validity analysis and descriptive statistics, and Amos was used to test the proposed factorial configurations of the instrument, and to compare the two sets of data (*t1* and *t2*; multi-sample analysis) for invariance.

[35] Given the results were found to be significant (Little's MCAR test results: $\chi^2 = 6462.115$, DF = 6221, Sig. = .016). According to this method, only if the test fails to be significant we can assume the missing data to be distributed randomly. Since the significance value was below the general threshold of .05, we can ascertain the missing data not to be distributed in a totally randomized fashion.

Chapter 7: Results

The version of EDG-D put to the test by us was the original scale proposed by N. Pinto (2012) comprising 36 items, because we considered it to be pertinent to assess the instrument's psychometric qualities in the original form against a set of data to which it wasn't tested yet – the sample used in Pinto's second study. Because of this, our study doesn't overlap the original one in any way; instead, it permits us to draw further the wideness of prior conclusions. Also, since the 2 items dropped in Pinto's (2012) seminal study directly concerned stage three (cf. “The Group Development Scale – Sport [EDG-D]” section), it was of vested interest to us to test them again, since they were part of the two stages that fused together in the original study (it was important to take advantage of their discriminative power).

At this point, and with the general aim of putting our model to the test against a more robust procedure in sight, we are going to subject EDG-D’s underlying factorial model to a series of CFA procedures, as means to find the most suitable factor configuration to the scale, hoping to accomplish a formulation that ends up rendering the EDG-D as a more widely usable and validated instrument overall. One of the main advantages CFA features is that it allows testing analytically a conceptually grounded theory – such as the MIDG – through the exploration of different ways of arranging measured information so that it can thoroughly represent scientifically relevant constructs (Hair et al., 2010). Also, there are few restrictions on the type of data that can be used in CFA when anchored on SEM, allowing the researcher to define a priori all existing relevant variables and correlations. CFA analyzes the relationships between factors and

estimates and removes the error of measure, maintaining only the common variance; it makes the identification of dimensionality easier by allowing the segmentation of factors and pure variables; it also allows for an easy identification of insignificant contributions upon variables (Byrne, 2005; Peralta, 2009). Finally, Ullman and Bentler (2003) highlight that CFA presents the advantage of testing the null hypothesis on the construct under scrutiny, instead of doing so in relation to measured variables, which is particularly handy when studying multidimensional and complex phenomena, such as group development.

First, we studied the subset of data concerning *t1*, against two differing design models: a four-stage model (cf. figure 2) – as established by the original MIDG conceptualization – and a three-stage model (cf. figure 3) – as the newly-found design emerging from previous research and tested in our study.

Four-factor Model

The first confirmatory factor analysis to which we proceeded – four-stage model, complete instrument (36 items; cf. figure 2) – revealed satisfying adequacy concerning the indices that assess the goodness of fit between our data and the hypothesized model: χ^2 (588, N = 566) = 1877.673, p = .000; it further had a SRMR value of .057, well below the maximum threshold of adequateness (.08) defined by Brown (2006); a RMSEA value of .062, just a little above the .05 optimal limit defined by Brown (2006) and .06 by Kline (2011) but still within the .08 recommended threshold by both; a CFI value of .921, which is favorable to the recommendations (to be above .90) of both Brown (2006) and

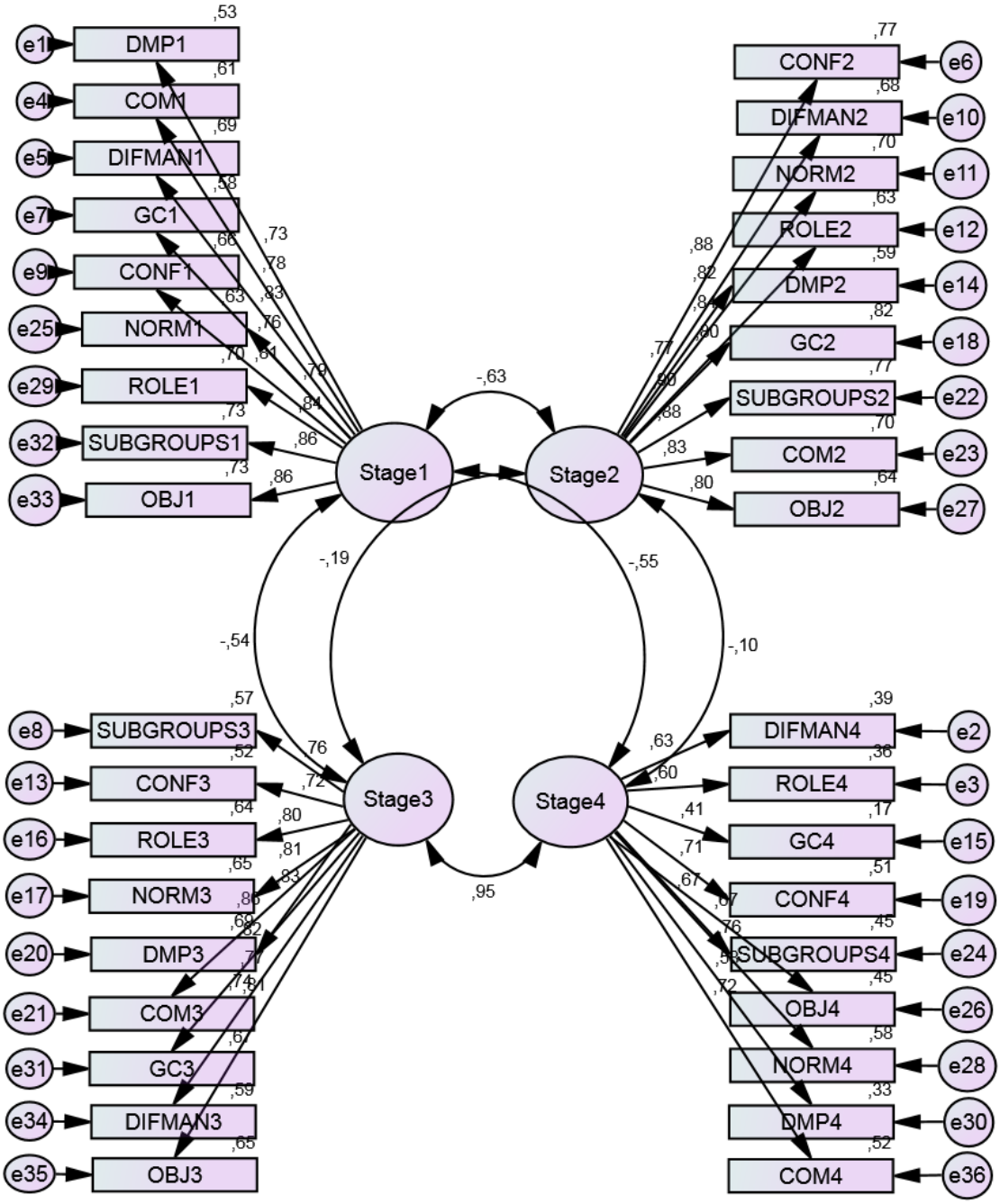

Figure 2. Four-stage graphical representation of the EDG-D (*t1*). The values close to the item boxes correspond to the amount of variance explained by the item (R^2); the values above the lines between each of the items and its corresponding factor are factor loading values (standardized regression weights) of the item (cf. appendix B for description of items' captions).

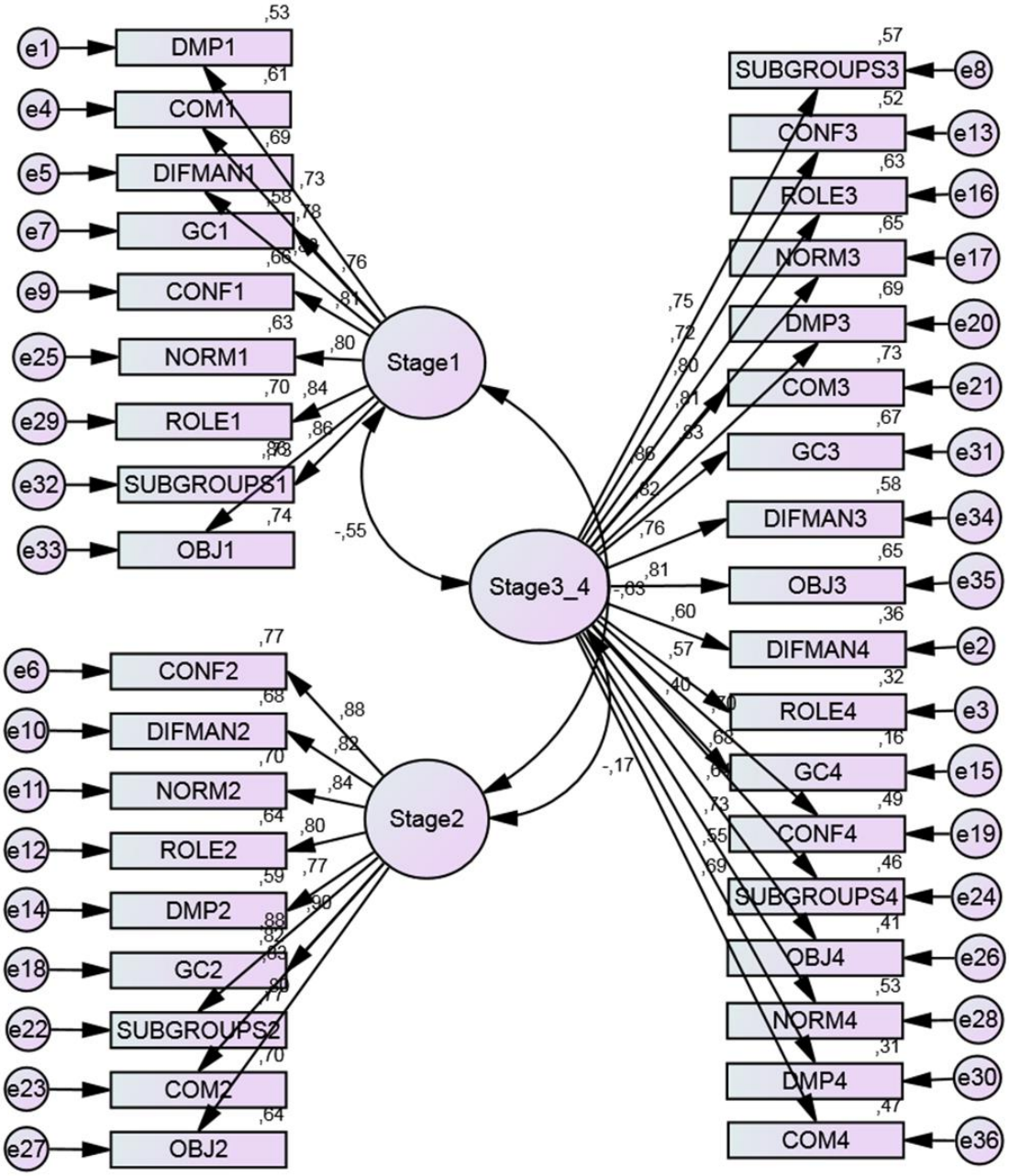

Figure 3. Three-stage graphical representation of the EDG-D (*t1*).

Kline (2011); and a TLI value of .916, above the .90 recommended by Brown (2006) (cf. table 3). Factor loadings also oscillated between .408 (minimum) and .904 (maximum), and therefore only one item fell below the minimum threshold suggested by Tabachnick and Fidell (2007) of .45 (cf. appendix C, table 11).

Since the group development model anchoring our research (Miguez & Lourenço, 2001) features developmental stages that are highly related between them and each stage is characterized by the focal expression of a given set of characteristics, we analyzed the level of covariance between the four latent variables, looking for possible overlapping effects (Byrne, 2005). Stage 1 (Structuring) and stage 2 (Reframing) had a high negative correlation (r = -.631); stage 1 and stage 3 (Restructuring) also featured a high negative correlation of -.538; stage 1 and stage 4 (Realization) had also a high negative correlation (r = -.546); stages 2 and 3 had a low negative correlation value of -.193; stages 2 and 4 had a low negative correlation as well (r = -.193); and finally stages 3 and 4 featured a high[36] positive correlation of .951, which is very close to perfect multicollinearity

Table 3

Goodness of fit (four-factor model).

	χ^2	*df*	*p*	CFI	TLI	SRMR	RMSEA
Four-factor model (36 items; t1)	1877.673	588	.000	.921	.916	.057	.062

[36] As reference values, we resort to Cohen's (1988) guidelines to interpret effect size: correlations between .10 and .30 are considered low or as having a weak association; between .30 and .50 they're considered to be medium or moderate; and above values of .50 correlations are considered strong/large.

(Ullman, 2007) and well above the .85 cutoff value defined by Byrne (2005). All the results were favorable with EDG-D's underlying conceptual grounds, except correlation values between stages 3 and 4, which signaled that there was a high probability that the scale was unable to thoroughly discriminate between stages 3 and 4 (cf. table 4).

Table 4

Correlations (r) between factors (t1; four-stage model, initial configuration [36 items]), as observed in figure 2.

	Stage 1 *Structuring*	Stage 2 *Reframing*	Stage 3 *Restructuring*	Stage 4 *Realization*
Stage 1 *Structuring*				
Stage 2 *Reframing*	-.631			
Stage 3 *Restructuring*	-.538	-.193		
Stage 4 *Realization*	-.546	-.193	.951	

Discriminant validity – that is, the extent to which a construct is truly distinct from other constructs, both in terms of how much it correlates with other constructs as well as how distinctly measured variables represent only a given construct (Hair et al., 2010) – is one of the most important validity cornerstones of CFA: this technique allows for an easy identification of discriminant validity issues across latent variables, while also rendering the identification of alternative factorial designs (hopefully with better

discriminant validity) very easy. Cross loading among several items (observed variables) is also a sign of lack of discriminant validity. The emerging high correlation between factors found at our procedures rendered the subsequent analysis of concurrent validity unfeasible.

Since a risk of multicollinearity among factors (latent variables) was found, discriminative validity was threatened, prompting us into finding ways of solving it (Hair et al., 2010).

At this stage, we should underline the emergence of a tri-factorial structure as an occurrence not specific to the present study: the same issue has been identified previously, specifically in the exploratory analyses inscribed in the original study of the development of the instrument (N. Pinto, 2012)[37]. This was later corroborated in research focusing on workgroups as well, namely that of Luís Marques (2010)[38] and A. Pinto (2014) – the latter being further reinforced by confirmatory procedures too[39]. We can

[37] The scale's original construct validity assessment (N = 439) comprised a principal component analysis (PCA) resulting in the items being distributed over 11 factors, which didn't feature any interpretability in the light of MIDG. By retrying the procedure – this time submitting the data to a varimax rotation forced to four factors – the items associated to stages 3 and 4 resulted as being grouped together in a single factor. A PCA was once again repeated, this time around forcing the varimax rotation to three factors, yielding comparable results (items 8 and 13 were dropped due to low factor loadings); the third factor was also found to be spurious. In Pinto's (2012) second study, the 34-item, tri-factorial version of EDG-D emerging from the initial study was tested for internal consistency and item total correlation, again yielding very robust results.

[38] This author also proceeded to a principal component analysis (PCA) relying on an orthogonal rotation (varimax) and free extraction of factors, resulting in the items being distributed over 7 factors, which also didn't feature any interpretability in the light of MIDG. The PCA procedure was repeated – with a varimax rotation forced to four factors – and the result was a tri-factorial structure, with stages 3 and 4 grouped together (fourth factor was found to be spurious). These results (three-stage model) were replicated on a third try, when the data was submitted to a varimax rotation forced to three factors. Subsequent reliability assessment further attested instrument's good properties.

[39] Finally, A. Pinto (2014) assessed the validity of an ameliorated version of Luís Marques' (2010) instrument: the initial exploratory procedure (PCA, n = 644) resulted in the emergence of six factors, once again non-interpretable in accordance to MIDG. A second PCA with a varimax rotation forced to four factors ensued, giving rise to the emergence of a unified 3/4 stage-factor (fourth factor was found to be

therefore conclude this issue as not specific to EDG-D, since the items related to stages 3 and 4 seemed to emerge unified even when non-sports teams were surveyed.

Three-factor Model (36 Items)

Since solving the collinearity issue was a necessity – besides being in line with previous research that focused both on sports (N. Pinto, 2012) as well as non-sports environments (Luís Marques, 2010; A. Pinto, 2014) – we chose to assume the emerging tri-factorial structure as the one corresponding to a more stable model overall.

As a first step, we proceeded to a confirmatory factor analysis to the model with all 36 items. As a result, it was found that items concerning stages 3 and 4 ended up grouped together into a unified, 18-item factor (cf. figure 3). The results revealed satisfying adequacy concerning the indices that assess the goodness of fit between our data and the hypothesized model (cf. table 5) with χ^2 (591, N = 566) = 1947.842, p = .000; we further took in consideration the four goodness of fit indices: an SRMR value of .059, which was below the maximum threshold of adequateness (.08) defined by Brown (2006); a RMSEA value of .064, below the advised limit of .08 as defined by Brown (2006) and therefore within acceptability range; a CFI value of .917, which is favorable with the recommendations (to be above .90) of both Brown (2006) and Kline (2011); and a TLI value of .912, above the .90 recommended by Brown (2006). Factor loadings and amounts of variance explained by the item (R^2) ranged as follows (cf. appendix C, table

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spurious). By forcing the retention to three factors, once again a tri-factorial configuration emerged. Reliability values were in line with those previously obtained. Subsequently, the author went on to test a 25-item version on the instrument (as emerging from the initial validation procedures) over a confirmatory factorial analysis (CFA) as means to attest whether this factorial design indeed was the best fit to the data, yielding very favorable figures regarding adjustment indices (n = 1530), A final reliability assessment further attested the instrument's robustness.

12): in factor 1, factor loadings stood between .728 (minimum) and .859 (maximum), with no items falling below the minimum threshold suggested by Tabachnick and Fidell (2007) of .45; still in factor 1, R^2 values ranged between .531 (minimum) and .738 (maximum); for factor 2, factor loadings were between .766 (minimum) and .904 (maximum), with no single item falling below the considered threshold; R^2 values ranged between .587 (minimum) and .817 (maximum); finally for factor 3/4, loadings were between .402 (minimum) and .857 (maximum), with a single item (item number 15) falling below the limit considered; still for factor 3/4, R^2 values ranged between .162 (minimum) and .734 (maximum).

Table 5

Goodness of fit (three-factor model).

	χ^2	*df*	*p*	CFI	TLI	SRMR	RMSEA
Initial model (36 items; t1)	1947.842	591	.000	.917	.912	.059	.064
Final model (27 items; t1)	1020.236	321	.000	.944	.939	.060	.062
Initial model (36 items; t2)	2166.529	591	.000	.930	.925	.080	.069
Final model (27 items; t2)	1220.574	321	.000	.946	.941	.083	.070

Stage 1 (Structuring) and stage 2 (Reframing) again presented a high negative correlation (r = -.631); stage 1 and stage 3/4 (Restructuring/Realization) now featured a high negative correlation of -.546; finally, stages 2 and 3/4 now presented a low negative

correlation of -.169 between them (cf. table 6). All the results enacted from this testing were now favorable with EDG-D's underlying conceptual grounds, reflecting a good adjustment to the parameters of the proposed model design.

Table 6

Correlations (r) between factors (t1; tri-factorial model, 36 items).

	Stage 1 *Structuring*	Stage 2 *Reframing*	Stage 3/4 *Restructuring/Realization*
Stage 1 *Structuring*			
Stage 2 *Reframing*	-.631		
Stage 3/4 *Restructuring /Realization*	-.546	-.169	

Three-factor Model (27 Items)

After this initial analysis, we proceeded to the removal of some of the instrument's items. We did so in order to favor a configuration of the instrument that would make it clearer, more balanced, and more parsimonious.

In order to proceed with this, as a first step, our instrument underwent the removal of items 15, 3, 17 and 20, successively and one at a time, in that order. These four items were dropped from the scale due to statistical criteria, but also due to theoretical reasons. One of the principals guiding our decisions was that whenever we encountered items with comparable statistical attributes but that were inserted into different stages, we were

careful to try to select the ones from stage 3/4 as a way for it to have a number of items that could be comparable to the other stages (9).

The first dropped item – item number 15, part of the "group cohesiveness" category and originally included in stage 4 – was removed because it featured both low R^2 and factor loading values – falling below the minimum threshold of .45 defined by Tabachnick & Fidell (2007), which meant that the error resulting from the measurement of this item was too great, leaving most of its variation unexplained.

We then looked for possible redundant items. The three items removed at this stage were selected partly because we believed that, in order for the scale to be duly parsimonious and balanced, the final array of items should as much as possible try to represent all the categories initially mapped by the instrument's authors, as well as feature a comparable number of items to that associated to the other stages. By relying on information provided by modification index (MI) estimates[40], we discovered that item number 3 (part of the "team members' roles" category and originally included in stage 4) presented a high error covariance with item number 2 (also included in the former stage 4, but in a different category, "managing differences among team members"). This meant that either of them had a considerable probability of measuring more accurately a distinct aspect of the model than the one they were designed for. It is desirable for items to be as much independent from each other as possible, and for their shared inter-correlations to be mainly explained by the factor they're a part of. We ended up electing item 3 for

[40] Which calculates the impact that the removal of a certain item would have in the decreasing of the model's overall chi-square value. This index is calculated by associating the errors from different items and factors with each other, while at the same time suggesting parameters that would improve the adjustment of the model.

removal based on the MIs, because when compared to item 2 it was the one presenting less favorable values overall (factor loading and R^2, cf. appendix C, table 12).

Finally, items 17 (from former stage 3, “norms regulating team's functioning“ category) and 20 (stage 3, “decision-making processes” category) were also removed based on their MI figures, since their errors were found to have high covariance with items from the same factor.

We then further proceeded to the removal of items 2, 24, 26, 13 and 21, based on a theoretical option decided by us, although also supported by statistical data – whenever theoretically comparable items were available, it was those presenting worse statistical indicators that ultimately were chosen for dropping. This option was based on the following theoretical criteria: a) items to be removed ought to favor an instrument configuration that’s more balanced and featuring increased parsimony; b) chosen items should favor a final configuration of stage 3/4 that would feature items representing every category of processes related to group development ; and c) chosen items shouldn’t be those considered to be describing stage 3/4 (Restructuring/Realization) more accurately, which researchers should seek to maintain in the scale.

We describe the final model adjustment in greater detail ahead (cf. figure 4). The statistical figures concerning this configuration (3-stage, 27 items) of the model are as follows: the results revealed satisfying adequacy concerning the indices that assess the goodness of fit between our data and the hypothesized model: this version of EDG-D had χ^2 (591, N = 566) = 1020.236, p = .000; it further had a SRMR value of .060, well below the maximum threshold of adequateness (.08) defined by Brown (2006); a RMSEA value

of .062, just a little above the .05 and .06 optimal limits defined by Brown (2006) and Kline (2011), respectively; a CFI value of .944, which is favorable with the recommendations (to be above .90) of both Brown (2006) and Kline (2011); and a TLI value of .939, above the .90 recommended by Brown (2006; cf. table 5) .

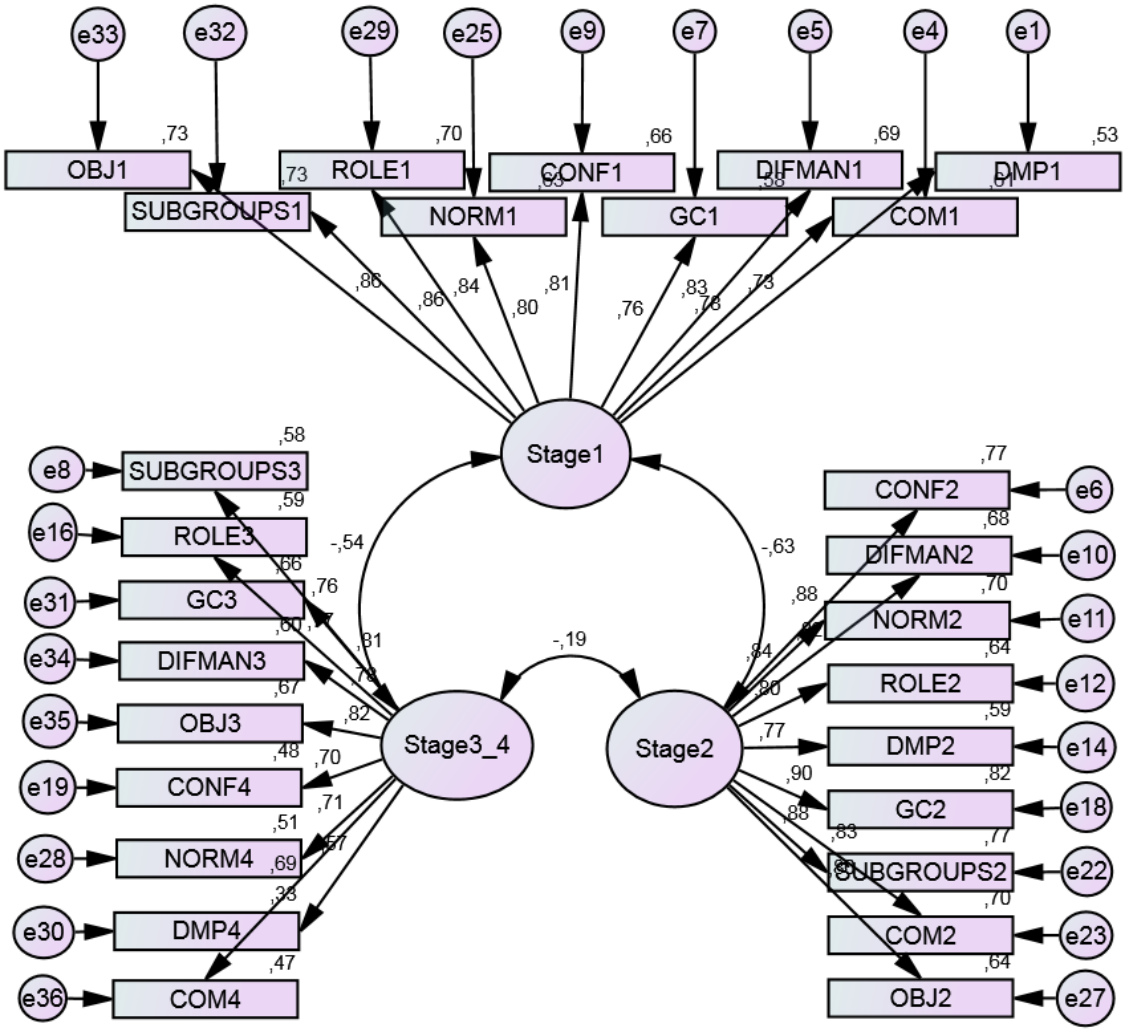

Figure 4. Three-stage graphical representation of the EDG-D without items 15, 3, 17, 20, 2, 24, 26, 13 and 21 (*t1*).

Stage 1 (Structuring) and stage 2 (Reframing) kept their high negative correlation (r = -.631); stage 1 and stage 3/4 (Restructuring/Realization) now continue to have a high negative correlation of -.545; finally, stages 2 and 3/4 now presented a low negative correlation of -.189 between them (cf. table 7). Individual items' correlation with their corresponding factor oscillated between .548 (minimum) and .870 (maximum), which are above the reference value of .30 defined by Field (2009)[41]. Factor loadings also oscillated between .687 (minimum) and .904 (maximum). In accordance with reference values set by Tabachnick and Fidell (2007) these values are rated as being "very good" to "excellent" (cf. table 8). We should highlight the usefulness of the CFA procedures in finding a suitable factorial structure for our model: it was through drawing comparisons between several CFA architectures that we were able to come up with the three-stage design, which is the one presenting the overall better fit to our data.

Table 7

Correlations (r) between factors (t1; tri-factorial model, 27 items).

	Stage 1 *Structuring*	Stage 2 *Reframing*	Stage 3/4 *Restructuring/Realization*
Stage 1 *Structuring*			
Stage 2 *Reframing*	-.631		
Stage 3/4 *Restructuring /Realization*	-.545	-.189	

[41] Similar reference values are put forward by Bryman and Cramer (2001) who suggest .32 as minimum acceptable, and Nunnally (1978), who says values are admissible from .30 on (although weak at such level). Our results are consistently ratable as good considering all the criteria above.

Table 8

Factorial analysis and reliability values: factorial internal consistency, items' coefficients of correlation and item total correlations (r) [t1 and t2; tri-factorial model, 27 items].

		t1				t2			
Factor	Item	Factor Loadings	R^2	Item Total correlation	Cronbach's alpha value (α)	Factor Loadings	R^2	Item Total correlation	Cronbach's alpha value (α)
Stage 1 *Structuring*					.943				.953
	1 (DMP1)	.727	.529	.723		.730	.533	.726	
	4 (COM1)	.782	.611	.764		.837	.700	.802	
	5 (DIFMAN1)	.829	.687	.802		.867	.752	.835	
	7 (GC1)	.759	.577	.743		.795	.632	.791	
	9 (CONF1)	.812	.660	.787		.884	.781	.855	
	25 (NORM1)	.797	.635	.758		.846	.715	.825	
	29 (ROLE1)	.838	.702	.814		.839	.705	.831	
	32 (SUBGROUPS1)	.857	.735	.828		.877	.770	.841	
	33 (OBJ1)	.857	.735	.823		.823	.677	.807	
Stage 2 *Reframing*					.954				.970
	6 (CONF2)	.877	.770	.848		.888	.788	.872	
	10 (DIFMAN2)	.822	.676	.802		.894	.799	.882	
	11 (NORM2)	.838	.702	.821		.913	.833	.892	
	12 (ROLE2)	.798	.637	.781		.840	.705	.826	
	14 (DMP2)	.768	.589	.747		.853	.727	.843	
	18 (GC2)	.904	.817	.870		.880	.775	.860	
	22 (SUBGROUPS2)	.880	.774	.857		.909	.827	.898	
	23 (COM2)	.835	.697	.821		.867	.752	.862	
	27 (OBJ2)	.800	.640	.785		.911	.830	.888	
Stage 3/4 *Restructuring/ Realization*					.913				.952
	8 (SUBGROUPS3)	.760	.577	.714		.854	.729	.835	
	16 (ROLE3)	.767	.588	.719		.814	.662	.789	
	19 (CONF4)	.696	.484	.676		.859	.738	.831	
	28 (NORM4)	.714	.510	.700		.754	.568	.747	
	30 (DMP4)	.572	.327	.548		.713	.508	.698	
	31 (GC3)	.812	.660	.757		.883	.779	.853	
	34 (DIFMAN3)	.777	.604	.727		.880	.774	.847	
	35 (OBJ3)	.817	.667	.775		.900	.810	.872	
	36 (COM4)	.687	.473	.676		.799	.638	.788	

Measurement Invariance

As a final step to further confirm the goodness of fit of current model's adjustment parameters (cf. figure 4), we proceeded to a multiple-group confirmatory factor analysis, with resource to the statistical property of measurement invariance (cf. table 9). By testing this assumption we're making sure the instrument is measuring the same psychological construct in all groups considered. This tool is usually used when trying to assess whether the items of a specific instrument keep the same meaning (i.e., psychometric properties) even if different populations are surveyed with it; in other words, whether those items have vulnerabilities that make them prone to be understood in a conceptually differentiated way between groups featuring different affiliations. In the specific case of our research, those multiple groups actually are the same respondents, but surveyed twice in the course of the same sports season (*t1* and *t2*). Measurement invariance has been widely used in a varied array of settings, including those with a comparable design to our study: testing for model invariance with the same set of subjects (same group) across time – alias testing for temporal stability (e.g., Bishop, Geiser, & Cole, 2015; Mäkikangas et al., 2006; Motl et al., 2000; Wicherts et al., 2004; Wu, Chen & Tsai, 2009)[42].

Therefore, by employing this technique we intend to test the instrument for measurement stability over time, hopefully casting off any measurement bias there may be. We use the two-sample data to test the parameters of our model for invariance.

[42] A recent review of measurement invariance applications may found in Schmitt and Kuljanin (2008).

Table 9

Measurement invariance analysis and global fitting indices (three-stage model; t1 and t2).

	χ^2	df	$\Delta\chi^2$	Δdf	CFI	ΔCFI	TLI	RMSEA
Model 1 – configural invariance (baseline model; unconstrained)	2240.810	642			.945		.940	.047
Model 2 – metric invariance (factor loadings constrained)	2320.052	666	79.242	24	.943	.002	.940	.047
Model 3 – factor covariance invariance (factor variances constrained)	2503.525	672	262.715	30	.937	.008	.934	.049
Model 4 – error variance invariance (error variances constrained)	2837.643	699	596.833	57	.926	.019	.926	.052

Measurement invariance is done by comparing a proposed model to a more restricted version of it: the model tested – in which a number of fixed parameters are set according to our preferences – is set equally across groups (or, in our case, a two-sample set), and comparisons are drawn between this model and different versions of it, whose parameters were left free to vary. If the free-to-vary versions of our model make it clear that the model is not able to endure the increased constraints, our model is said to be non-invariant.

In the scope of this analysis, we follow Jöreskog's (1993) strategy for the assessment of the comparability of factor structures, by following a succession of models ordered hierarchically with increasing degrees of freedom, which fundamentally means adding constraints as we go through each of the increasingly restrictive models. Each

model is more restrictive than the previous because past models are nested inside the model whose fit is currently being put to the test – therefore, later models are actually a cumulative version of the constraints previously tested. This approach is widely perceived as the most effective and versatile way of conducting measurement invariance testing (Steenkamp & Baumgartner, 1998).

As a reference, we're following the succession of tests suggested by Vandenberg and Lance (2000). In the first procedure, our model 1 is testing configural invariance, the first step to establish measurement invariance (cf. table 9). It assesses whether the respondents from both *t1* and *t2* perceive the construct in the same way, i.e., if the basic model structure is proved to be invariant across these two deployments of the scale. The second model checks for metric invariance, meaning it constrains all factor loadings to be equal across both *t1* and *t2*, and tries to establish whether the participants answering the instrument did so in the same way regardless of the temporal gap taking place between both applications of the scale. According to Anderson and Gerbing (1998), both models 1 and 2 are considered to be a part of the "measurement invariance" models[43] (in a narrower sense than has been implied up to this point). These models focus on testing the relationship between measured variables and latent constructs.

The models tested up to this point are considered essential to verify the measurement invariance assumption. The ones explored from this point on are considered optional.

[43] Models falling within this category are able to assess invariance of construct, factor loading, item intercepts and error variances (Milfont & Fischer, 2010).

Next, we tested a model falling into the "structural invariance" category[44] (cf. table 9). We should mention that this category of models isn't necessarily nested; however, the procedure we undertook did nest it, with the model being tested constraining all estimated factor loadings, as well as factor variances. The model put to the test by us – model 3, factor covariance invariance – in addition to the constraints already nested, is constraining all factor covariances as well (Byrne, 2010). The model thus assumes that all factors have the same relationship in all sets of data, plus the conditions it is already nesting.

Finally, model 4 (error variance invariance) is also a measurement invariance model – hence accumulating constraints from all supraordinal measurement invariance models – and tests whether the same level of measurement error is present for each item between *t1* and *t2* (herein methodologically comparable to distinct groups), and therefore constrains all error variances into the model, plus all the other accumulated constraints. Being the model in the end of the nesting chain, it is the one accumulating the most constrains: all estimated factor loadings, factor variances and factor covariances (Byrne, 2010; cf. table 9).

In order to evaluate if the constrained models are invariant or non-invariant, we're resorting to the reference values set by Cheung & Rensvold (2002), which establish that ΔCFI[45] values are not acceptable if over .01. As a general rule, researches usually use this

[44] Altogether, the models under this category are able to assess invariance of the variances, covariances and means of the latent variables (Milfont & Fischer, 2010).

[45] Cheung and Rensvold (2002) argue that if different invariance models are subjected to analysis there are differences in standard errors and critical values; however, they consider a general criterion can be elicited, since variations between models are very small. Therefore, they suggest that if ΔCFI is equal or smaller

condition. Chi-square is not going to be used to assess the adjustment of the model, since as a measure it is very sensitive to sample size, causing decreased effectiveness (Cheung & Rensvold, 2002; Byrne, 2010)[46].

We systematically tested each model, one at a time, obtaining favorable results, thus prompting us to progress into testing subsequent increasingly constrained versions. By matching the reference values set by Cheung & Rensvold (2002) with the values present at table 9, we can conclude that the various models tested by us are overall invariant, showing ΔCFI values well within the acceptable range of less than .01, except for model 4. CFI, RMSEA and TLI values for the various measurements also fell within the reference values defined in the previous section, except RMSEA value for the same model (4).

The results ascertained throughout this analysis strongly corroborate the robustness of the instrument hereby validated, since EDG-D showed a high capability of sustaining stability when tested against temporal variability. Models subjected to various levels of constraints all fell within strong acceptability thresholds, except for model 4, which slightly surpassed ΔCFI and RMSEA cutoff points defined by Cheung & Rensvold (2002). Actually this was the most demanding constrained model put to test in our analysis, and as Byrne (2010) puts it, "the inclusion of these structural and measurement residuals in tests for invariance is somewhat rare and considered to be excessively

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than -.01, the null hypothesis of the invariance shouldn't be rejected.

[46] Model fit differences between constrained and unconstrained models are often determined by looking upon the chi-square differences test ($\Delta\chi^2$) – which is a null-hypothesis significance test for a difference between two groups. If samples are large however, even a small difference in adjustment between the constrained and unconstrained models can elicit a big $\Delta\chi^2$, hence making this test impractical, given that the null hypothesis should be rejected even if tiny differences are found (Cheung & Rensvold, 2002).

stringent". For these reasons, we believe disregarding these results is an appropriate decision. The overall obtained results allow us to be confident that any differences that come to be found in groups through the usage of this instrument are due to real variations in group development as a result of the passage of time and not to variations in the configuration or interpretability of the scale.

Finally, we tested for internal consistency of the final tri-factorial model. For *t1* (cf. table 8), Cronbach's alpha values (reliability assessment) revealed very good results – in accordance with the guidelines prescribed by Nunnally and Bernstein (1994) – for each of the group development stages evaluated by the instrument: $\alpha = .943$ for stage 1 (Structuring), $\alpha = .954$ for stage 2 (Reframing) and $\alpha = .913$ for stage 3/4 (Restructuring/Realization). For *t2* (cf. table 8) the setting was very similar: $\alpha = .953$ for stage 1 (Structuring), $\alpha = .970$ for stage 2 (Reframing) and $\alpha = .952$ for stage 3/4 (Restructuring/Realization).

All the results of the tests carried out by us were favorable with EDG-D's underlying conceptual grounds, and reflect very good adjustment to the parameters of the proposed model design (three-stage model).

Chapter 5: Discussion

The main objective of this study was to contribute to the validation of EDG-D, a measuring instrument aimed at assessing group development on sports teams. This is a scale that builds upon the MIDG framework, a theoretical foundation that's intended to look at group development through a sociotechnical perspective, acknowledging the existence of two fundamental subsystems that are at the core of the subsistence of any group: task and socio-affective. The study of group development is highly important since groups are one of the most challenging and powerful management tools of modern day organizations. This instrument adds further diversity to the previously existing pool of instruments intended to address group development, while also contributing to the creation of scales directed specifically at assessing particular operating fields – in this case, the sports field. Availability of duly validated instruments is a key condition to good and lasting psychological intervention.

The present study shows that the EDG-D is a powerful instrument with good discriminative power and overall strong psychometric capabilities – namely those of construct validity: dimensionality, reliability and structural stability over time. The emerging three-stage model adjustment presented very robust reliability and factor loading values. With the changes proposed to it by us, we are confident it now features the advantage of increased parsimony. Since the dropped items were thoroughly evaluated and selected prior to their removal, we believe the instrument has achieved highly balanced standards. By submitting the scale to a measurement invariance procedure, we aimed at exploring even further the solidness of the present model fit.

These results add up to previous research by N. Pinto (2012) – who conceived this instrument and was the initial driving force behind its development – by Luís Marques (2010) – that adapted the EDG-D to work teams, consisting of an array of 23 items – and by A. Pinto (2014) – that further studied the EDG in work teams, in order to turn it into a more robust measure, this time encompassing 25 items. Inserted in this line of research, our work contributes to the development of EDG-D, now comprising 27 items. Even if not completely in tune with MIDG's theoretical foundations – given that our results identify a three-factor structure, aligned with previous results, whereas the model predicted originally the existence of four factors – our results are still highly interpretable in accordance to MIDG's specifications.

In our opinion, the interpretability of the results attained by us warrants some discussion. The element prompting us to test for a configuration other than the tetra-factorial suggested by Miguez and Lourenço's (2001) model was the emergence of a high correlation between factors correspondent to stages 3 and 4, as a result of the confirmatory factor analysis to the four-factor model (36 items, *t1*). By checking the degree to which factors correlated between each other we discovered a risk of multicollinearity between stages 3 and 4 (cf. table 4), which violates the assumptions established by various authors (e.g., Ullman, 2007) for this kind of procedures.

These findings are echoed in previous research: Peralta (2009) came across comparable results (i.e., high correlations among the two later factors) when validating the group development instrument developed by himself, specifically in the course of the

confirmatory factor analyses pertaining to both the socio-affective – in which a correlation of .85 was obtained – and the task – r = .86 – subscales, even if proof of an overall better fit for a four-stage model was ultimately extant. These results, however, were later found to be not as strong, when cross-correlations between all factors from both subscales were computed (Peralta, 2009, p. 38). It is argued the effect found in correlations may stem from measurement error and items' unique variance; on the other hand, no resembling error is thought to have been produced in the course of the CFA procedures. A similar occurrence was noted to have happened in J. Oliveira (2012), where testing for a tetra-factorial structure resulted in discriminant validity issues between the factors associated with stages 1, 3 and 4 of group development[47], coupled with correlations rated as high and very high between them, including an r of .89 between factors therein referred to as "Integration" (corresponding to stage 3 of MIDG) and "Realization" (stage 4) – and hence clearly above the cutoff point set by Byrne (2005).

Ito and Brotheridge's (2008) findings also support a tri-factorial structure of group development, and Wheelan and Hochberger (1996) raised concern on whether a bi or tri-factorial structure would be more adequate in describing the phenomenon, since issues emerged in discriminating between stages 3 and 4 of their model (r = .83). In spite of that, other studies also exist seemingly asserting group development as being better described by a tetra-factorial structure (e.g., Miller, 2003), hence rebutting, at least partially, the three-stage hypothesis.

[47] As conceptualized within the particular scope of J. Oliveira's (2012) model.

The emergence of a factor combining items corresponding to stages 3 and 4 is consistent with previous research on EDG-D (Laura Marques, 2014; Luís Marques, 2010; A. Pinto, 2014; N. Pinto, 2012). We should point out, however, that in all of those cases the aforementioned structural configuration emerged as a result to exploratory procedures, and in some cases were subsequently reinforced by validating confirmatory procedures as well (A. Pinto, 2014). This leaves us with no previous studies on which to draw direct comparisons against; on the other hand, comparisons to contributions by several other authors can also be drawn (e.g., Ito & Brotheridge, 2008; Miller, 2003; J. Oliveira, 2012; Weeland & Hochberger, 1996), but we must acknowledge the fact that more fundamental conceptual and methodological differences are extant, even if some of those authors seem to be closer (J. Oliveira, 2012; Peralta, 2009) while others draw farther (Ito & Brotheridge, 2008; Miller, 2003; Weeland & Hochberger, 1996) to the set of theoretical and methodological specifications in which we frame the present research.

Past research also echoes the existence of three-staged models and instruments of group development, in literature non-specific to MIDG. Regarding contributions falling outside of the scope of our model, and getting back to systematizations of group development models (Chidambaram & Bostrom, 1996; Smith, 2001), we should highlight a few models pinpointed as being edified over a three-stage conceptualization.

Developed in association with training and therapy groups, Kaplan and Roman's (1963) model falls under the category of sequential models – more particularly in its linear and progressive subtype – in accordance to Chidambaram & Bostrom's (1996)

systematization. It describes group development as a process characterized by increasingly higher levels of maturity coupled with a progressive improvement in the quality of group's outputs. Again according to Chidambaram and Bostrom (1996), this model features noticeable similarities with other models (Heinen, 1971; Jacobson, 1956; Schroeder & Harvey, 1963), most notably with Bennis and Shepard's (1956) linear progressive one, which Chidambaram and Bostrom (1996) consider "perhaps the best articulated model of linear progression" (p. 162), and is characterized by increased communicational patterns (again as a sign of growing maturity) as the single most relevant element of the developmental process. From all the referred models, however, Kaplan and Roman's (1963) is the only one devised within a three-stage formulation. Chidambaram and Bostrom (1996) help us understand the theory: in its first stage (referred to as being centered on a dependency theme), the leader has a central role and members seemingly display exacerbated expressions of helplessness; on the second stage (power-themed) there's a manifest increase in tension and hostility, and a critical attitude towards the leader is sensed, as well as a decrease in enthusiasm for the task; finally, the third stage (focused on intimacy aspects) is characterized by a sense of "settling in" and increased involvement, coupled with more frequent direct communication. Concerning the initial stage, Bakali, Wilberg, Klungsøyr, & Lorentzen (2013) further add that Kaplan and Roman's model comprises "an initial positive atmosphere characterized by engagement, universality, and members searching for common issues" (p. 367); moreover, this theory is also convergent with a number of other theories (e.g., Tuckman & Jensen, 1977; Wheelan, 1994) in acknowledging the existence of a final "termination"

stage. While some aspects allow us to draw comparisons with MIDG's underlying theoretical specifications – e.g., the increase of communicational patterns as group development unfolds – some others make it fairly difficult to create a direct correspondence – e.g., the existence of a termination stage in Kapan and Roman's (1963) model.

Another model highlighted by Chidambaram and Bostrom (1996) as pertaining to a three stage conceptualization of group development and that is also of the sequential type (progressive subtype) is the equilibrium model[48] (Bales, 1950, 1953, 1970; Bales & Strodtbeck, 1951; Heinicke & Bales, 1953). According to the literature review put in place by Heinen and Jacobson (1976), initially the model comprised the following stages (Bales, 1950, 1953; Bales & Strodtbeck, 1951): the first one was characterized by a focus on orientation issues (according to this review, this stage was comparable in scope to Tuckman's first stage), the second one was characterized by a focus on evaluation issues (whose elements corresponded to Tuckman's second and third stages) and finally the third one featured a focus on control issues (aligned with Tuckman's fourth stage). Later on, and still according to Heinen and Jacobson (1976), beginning with Bales and Strodtbeck (1951)[49] those stages were somewhat reframed: "orientation" stage was maintained; as a second stage (and corresponding to Tuckman's second stage as well) the model now predicted a focal point of negative reactions (conflict); finally, the third stage

[48] As previously discussed, a debate remains concerning whether this model should be classified as a progressive or as a cyclical and pendular model (Smith, 2001; cf. "Group development" section). Consensus exists, however, regarding the crucial role it played in jumpstarting systemized research on group development, at its time (Hare, 1973); in the 1970s it was also perceived as the model "of task group development supported by the largest amount of research" (Heinen & Jacobson, 1976, p. 100).
[49] But also referencing Bales (1953, 1970), and Heinicke and Bales (1953).

(again coupled with Tuckman's third phase) now was characterized by the expression of positive emotions.

Chidambaram and Bostrom (1996) further describe the orientation stage as one characterized by the occurrence of the group's earliest meetings, when an exchange of information among group members takes place and an overall exploratory attitude is enacted. In the evaluation stage, the group goes through a similar process, this time around regarding team member's opinions; personal views and attitudes are also put forward. Finally, in the final, control phase group members try to take control of the group by exerting pressure upon it through the enactment of both positive and negative acts, as well as by carrying overt actions. Additionally, Chidambaram and Bostrom (1996) mention that: a) task-oriented actions tend to decrease over group's life; b) there's a noticeable increase in socioemotional actions carried out; and c) negative actions are most noticeable in stage 2, after which they tend to decrease as well. At the same time, it is perceptible that a hierarchy is gradually being established (Chidambaram & Bostrom, 1996), and changes in group structure are concomitant to those happening in affective relations (Heinen & Jacobson, 1976). Particularly in stage 2, behavioral patterns aligned with the overcoming of obstacles found to be in the way of the attainment of group objectives and in the organizing of group activities according to group's identity (as it emerged in phase one) are seemingly dominant.

Still in relation to the equilibrium model, Smith's (2001) review, on the other hand, revealed a slightly less clear picture regarding the analysis of the overlap between stages when comparing it to other models: he stablished four general stages based on the

analysis of the various cyclical and pendular models available. According to him, the first one – formative stage – is very similar in scope "to the first stage of linear progressive models" (Smith, 2001, p. 27), and is characterized by group members coming together and forming a specific physical place; the definition of group identity and task's specifications and boundaries is also addressed at this stage, in which Bales and Strodtbeck (1951) underline the role played by the open sharing of information among members, which therefore "increases group's knowledge of the task's requirements and demands" (Smith, 2001, p. 27). Regarding stage 2 – information gathering, goal and role clarification stage – Smith (2001) points out that a certain amount of overlap – specifically in relation to stage 1 in terms of the activities involved in information gathering and role clarification – may be extant, mostly due to the inherent recurrence of events characteristic of this type of models. He further adds that at this stage the group is overly concerned about achieving an in-depth understanding of the group's task – ascertaining its clear purpose and required set of skills and resources is therefore of crucial importance. According to Bales and Strodtbeck (1951) this is the point in time when groups review and aggregate all the information and opinions gathered up to that point in relation to the task at hands. Smith's (2001) third stage – decision making and structural stabilization stage – again acknowledges the possibility of spilling over individual role and group structure issues from the previous stage into this one. It is at this stage that work patterns and relationships among group members get consolidated, as well as some structural and procedural aspects fundamental to the attainment of group's task-related goals. Smith (2001) further adds that within Bales and Strodtbeck's (1951)

theorization, at this stage, members tend to push for a quick decision, and by doing so they're also making way for their ideas to prevail over others'. Finally, Smith's (2001) last (fourth) stage – implementation and production stage – is characterized by an overall engagement of group members towards work production, in strict adherence and fulfillment of their plans (i.e., agreed-upon tasks). Frequent assessments are also done to check if the group is meeting the expectations – and at times permitting a relapse into earlier stages in order for it to deal with whatever issues remain unresolved.

Smith's (2001) overlap gets troublesome when compared to Heinen and Jacobson's (1976) analysis, because Smith's review considers certain elements from Bales and Strodtbeck's (1951) second stage – evaluation – to be transversally verifiable across stages 2, 3 and 4 of his "composite" take on cyclical and pendular models; a similar occurrence is also seen in relation to Bales and Strodtbeck's (1951) control (third) stage and its dispersion (or overlapping) across Smith's (2001) stages 3 and 4. While Bales and Strodtbeck's (1951) orientation and evaluation stages seem to find correspondence in adjacent stages in Smith's (2001) conceptualization, Smith's third stage acknowledges correspondences in Bales and Strodtbeck's (1951) evaluation and control stages; the exact same correspondence happens regarding Smith's (2001) fourth stage. When comparing to the MIDG, it is a bit difficult to draw serious comparisons, given that fundamental differences can be perceived between these two conceptualizations – e.g., the equilibrium model predicts a decrease in task-related matters while at the same time an increase in the exploring of affective themes as group development unfolds; the MIDG is founded on assumptions predicting the exact opposite.

Still in the progressive blend of group development models – but this time around leaning more into those of the cyclical type (and life cycle subtype) – Chidambaram and Bostrom (1996) also pinpoint Dunphy's (1964, 1974) model, which was the result of research undertaken with self-analytic and training groups. According to Chidambaram and Bostrom (1996), "this model is similar to the linear progressive models except for its emphasis on the terminal stage" (p. 171). By focusing on groups featuring appointed leaders, at its first stage – "dependency" – this model describes group members as being highly dependent towards the leader, to whom they turn seeking direction regarding task-related matters. In the second stage of group development – "fight/flight" – autonomy is developed among group members, and there's a growing sense of hostility towards leader's suggestions; subgroups are also formed, coupled with an increase in group cohesiveness. Finally, in the third (and last) stage – "pairing work" – participation between group members is overly strengthen and they tend to voice their concerns related to the impending loss of the group. Moreover, this theory has inescapably contributed to the establishment of an ending stage in group development theorization (cf. "Group development" section). Also, through the scope of these researches, it became evident that the interactional patterns undergone by team members as time unfolds have the power to transform a collection of individuals into an actual group. Again, contrary to MIDG's specifications is the fact that Dunphy's model accounts for a terminal stage.

Still under the same category (cyclical type; life cycle subtype), Chidambaram and Bostrom (1996) list another three-staged model: Spitz and Sadock (1973) analyzed group development dynamics in a sample of purse groups of nurses in training. This

model devises group development as going through the following stages: in stage 1 – "initial confusion" – there's a noticeable level of anxiety in members, who behave somewhat cautiously even if they're also apparently curious about group's functioning; in stage 2 – "interdependence" – good levels of trust develop among group members, and group's interaction relies on it as well as on a higher level of cohesiveness overall; finally in stage 3 – "disengagement" – group undergoes separation anxiety precipitated by its impending adjournment, and positive feelings have dominance when dealing with the leader. Comparing to MIDG, Spitz and Sadock's (1973) seems to differ significantly: aside from focusing on adjournment-related issues in the last stage (inexistent in MIDG), there seems to be little reference to a conflict-ridden stage of group development, as is the case in MIDG's second stage.

Crossing over to the recurring subtype of sequential models, we should highlight Schutz's (1958) FIRO model, which is composed by three stages as well. It has already been described earlier in the present text (cf. "Group Development" section). In general terms, we should underline the presence of two cycles of group development, each consisting of the same similar three stages, only happening in opposite directions: the first cycle develops in the direction of growth, while the second one describes action happening in reverse to that sense. Once groups reach maturity, they're perceived as entering a regressive phase of development – at the turning point between the two cycles members disengage from the affective ties built up to that point, losing their sense of group identity and ceasing to try to influence other members. The first stage – "inclusion" – is when group members are finding their way around it and dependence begins; then

comes the second stage – "control" – which is when some group members start eliciting pressure on others as an attempt to influence them; and finally we come across the third stage – "affection" – in which a need to like and be liked is noticeable, and interdependence starts being disseminated. This conception of two prescribed cycles – one maturity-bound, while the other predicts a sort of rebound – is somewhat distant from group development integrated models, such as Wheelan's (1994) and Miguez and Lourenço's (2001).

Also filed under the recurring subtype of sequential models, we can find another model identified as comprising a three-staged conceptualization (Chidambaram & Bostrom, 1996): it was developed by several authors (Bion, 1961; Stock & Thelen, 1958; Thelen, 1954, 1956) and focused on identifying recurring cycles integrated in the unravelling of group dynamics in a broader sense (for that matter, this research team focused on analyzing the degree of sophistication verifiable in the structure of work groups; those groups featured an appointed leader; and the group had to deal with "real world" tasks). The main argument basing this model is that groups are permanently trying to sort out some problem they might have come across, and every time a problem is solved, a new one just emerges – hence the recurring cycle pattern. This model also acknowledges and focus on noticeable swings in emotions and workflow, that affect groups throughout their entire developmental life. According to these authors, group development is systematized through the following set of stages: in the first one – "dependency" – there's a certain level of dependence towards either the leader or some external standard, which may be exerting some sort of similar influence upon the group;

then comes the second stage – "pairing" – on which members turn to each other seeking for more comprehensive emotional interactions; finally, in the third stage – "fight/flight" – either the group is strengthened enough to fight possible menaces it might come across, or, on the other hand, those menacing events may elicit an avoidant response. The MIDG actually has Bion's work as one of its major influences, hence the resemblance at some key aspects between the two models.

Finally, Olmsted (1962) developed a model intended to describe development in social groups. Heinen and Jacobson (1976) explain Olmstead's model as distributing a few group attributes among three classifications: "rudimentary group attributes" have to do with the acquaintance of group members and the establishment of basic interaction patterns; "emerging attributes" are related to the structural development of the group as it goes on into establishing standardized behavioral patterns aimed at accomplishing a task; finally, "mature attributes" deal mostly with what results stem from previous developments, namely, a behavioral code and a noticeable dominant tone of group interaction. Comparing to Tuckman's (1965) model, his and Olmsted's first stage coincide (its main scope consists of getting acquainted and enacting basic interactional patterns); Heinen and Jacobson (1976) remark, however, that Olmsted's second stage ignores the affective relations and mostly describes aspects related to group's structure, namely those that have to do with standardized behavior patterns – hence rendering it incompatible with MIDG specifications too. Olmsted's (1962) second stage is said to correspond to Tuckman's second and third, and his last (third) stage – in which mature behaviors are noticeable, a behavioral code is in place, as well as a dominant tone of

group interaction – is said to relate to Tuckman's (1965) fourth stage of group development.

Returning to the scope of our research, as it was expected within MIDG's specifications, stage 1 (Structuring) and stage 2 (Reframing) displayed a high negative correlation (r = -.631), since big differences exist between these two stages. These are dully elaborated by A. Pinto (2014, p. 210): stage 1 is said to be characterized by careful and superficial relationships, while in stage 2 troubled relationships are the norm; in stage 1 there's not much room for individualized responses to group stimuli (a high degree of conformity is noticeable, and deviations from group norms are not very frequent) whereas in stage 2 group members are much more likely to erupt in turmoil and act in defiance of pre-established group norms, as well as to try imposing their own set of regulations (shaped within the newly-formed subgroups); in stage 1 decisions tend to be unanimous, usually in accordance to leader's instructions, whereas in stage 2 agreement is rarely established; finally, in stage 1 subgroups are neither frequent nor encouraged, whereas in stage 2 they are naturally formed and act as coalitions, perceiving each other as a threat. The existence of significant differences between stages 1 and 2 is echoed in past research (M. Oliveira, 2011; Ramalho, 2008).

In our research, stage 1 and stage 3/4 (Restructuring/Realization) show a significant negative correlation of -.54, which is also traceable to our theoretical model. These results point in the same direction as the results from A. Pinto (2014), although our correlation is considerably higher when comparing to hers. In our opinion, such high

correlation can be attributed to fundamental differences in the focus of group members at these two stages: it goes from being centered in socio-affective matters (stage 1) to be leaning more towards task-related aspects of group life (stage 3/4). Decision-making goes from being much centered and dependent on leader's orientations (stage 1) to being driven by group members' natural-flowing sense of consensus (stage 3/4); subgroups go from being non-existent in stage 1 to being widely functional and stimulated in stage 3/4; in stage 1 conflicts are avoided by group members, whereas in stage 3/4 they're approached in a constructive manner; in stage 1 group members simply comply with the instructions given by the leader, while in stage 3/4 rules and roles are openly debated and modified if the need is identified. Overall, the group goes from a state in which it is only beginning to grasp its way around, to a state in which ultimately both the individual is more individual and the group is more group (Dimas, 2007). These results are consistent with previous research findings identifying substantial differences between stages 1 and 3/4 (Alves, 2012; Jensen, 2008; Lourenço, 2002; Monteiro, 2007; M. Oliveira, 2012; Peralta, 2009; A. Pinto, 2014; E. Pinto, 2009; Ramalho, 2008; Rodrigues, 2008). Comparing to A. Pinto's (2014) findings, the differences in correlation weights may perhaps be attributed to the fact that probably sportspeople have less of a hard time when they're trying to be mindful of effectiveness criteria that are objective (e.g., number of games won; number of goals scored; ranking position in the league, etc.) when compared to workgroup members, whose measures of effectiveness may often be less tangible. This may elicit the effect of producing differences in the way groups from differing affiliations

percept differences in group development stages, hence making the impact of these differences more obvious to respondents in the sports context.

Stages 2 and 3/4 presented a correlation of -.189, in line with the results ascertained by other authors who had previously undertaken comparable research (J. Oliveira, 2012; Peralta, 2009; A. Pinto; 2014), although in comparison to those studies ours turned out to attain a considerably lower *r* value. The relationship between these two factors was moreover expected to elicit the strongest negative correlation among those being surveyed[50]. Overall, our results also find resonance in wider, past research related to MIDG, even if to varying degrees (Alves, 2012; Dimas, 2007; Guimarães, 2009; Jensen, 2008; Lourenço, 2002; Luciana Marques, 2009; Monteiro, 2007; M. Oliveira, 2012; Peralta, 2009; A. Pinto, 2014; E. Pinto, 2009; N. Pinto, 2012; Ramalho, 2008; Rodrigues, 2008). A. Pinto (2014) interpreted her results as the expression of group members in stage 2 being centered on socio-affective issues, whereas in stage 3/4 they are much more focused on task-related matters; in stage 2 group members are counter-dependent upon the leader, and a general sense of disappointment, tension and turmoil is felt, while in stage 3/4 the overall climate is one of trust, cooperation and interdependence; subgroups, opposed against each other and perceived as a menace in stage 2, are stimulated and widely accepted in stage 3/4; finally, in stage 2 decision-

[50] As a reference – and considering correlations among corresponding factors only – J. Oliveira (2012, p. 317) attained a correlation value of -.49, Peralta's (2009) results ranged between $r = -.317$ and $r = -.629$ (depending on whether it's the analysis of the relationship between stage 2 and 3 or 2 and 4 that we're focusing on, as well as the methodological moment under consideration), and A. Pinto's (2014) *r* value was also of -.49. As a side note we should point out that, depending on the author under analysis, the corresponding factors differ in terms of theoretical grounds and methodologies in use (although all those herein referenced are theoretically grounded in the MIDG to a large extent; cf. "The Integrated Model of Group Development [MIDG]" section for more details).

making processes usually have to be regulated formally (e.g., through voting), whereas in stage 3/4 they tend to flow easily and garner consensus on everyone's behalf (both content and procedure wise). We can also speculate about the reasons why our correlation is lower: it may stem from the nature of the groups involved in our research – i.e., sports teams – in which less noticeable differences across developmental stages may be related to the fact that not rarely in the sports field coaches enact a directive leadership style, hence offsetting much of the turmoil and defiance one would expect to witness within groups for the duration of stage 2. Certain characteristics inherent to this stage – such as the emergence of antagonist subgroups – clash with some of sports teams' core goals; these are issues that certainly are actively addressed by coaches who seek to neutralize them to the best of their ability (often in a directive fashion), since it is pivotal that sports teams "work as a team", i.e., that its team members are all aligned within a common, non-conflictual mindset. It is the coach's role to propel the engagement of sportspeople into transitioning from a socio-affective-centered group existence (e.g., one in which relational concerns among team members may have not been offset yet) to increasingly task-focused entanglements of individuals (e.g., that duly develop functional behavioral patterns and strategies aligned with enhanced outcome attainment). These suppositions are in line with the ones put forward by N. Pinto (2012, p. 262) to explain the dissonance found in later stages of group development between leadership style expected under MIDG specifications and the actual style found to be put in practice by sports teams' coaches.

Our results, showing that the instrument has good psychometric qualities, clearly reinforce conclusions from preceding studies, as well as the original MIDG model itself, since a three-stage configuration features high interpretability in the light of the original conceptualization of the model.

In convergence with previous research (Luís Marques, 2010; A. Pinto, 2014; N. Pinto, 2012) we also find it acceptable that items corresponding to stages 3 and 4 emerge together in a single, unified stage 3/4 (Restructuring/Realization), since the authors of the model admit that the exact borders of these two stages are in some cases hardly distinguishable, given the closeness of their properties. Concerning this matter, we echo the opinion voiced by N. Pinto (2012, p. 186), according to whom "these stages possess common cornerstone characteristics, and existing differences are more of a frequency and/or intensity nature. This way, the items' redaction itself, even if we were as careful and precise as possible, may have not achieved a sufficiently distinctive result (and this may too be an explanation for the results obtained by us, constituting a possible limitation of our work as well)". These considerations find at least partial support in Peralta's (2009) findings, on which most of the highest correlations across factors were found between factors relating to stages 3 and 4. Further consolidating these findings, the analysis stemming from the ensuing path dependency also found that stage 3 had a direct and positive effect on both subsystems of stage 4, meaning that actions in both stages 3 and 4 are highly inter-related.

During the course of this work, it turned out to be non-feasible to maintain MIDG's initial configuration of four developmental stages, which was something we

would otherwise be reluctant to do without having very consistent empirical and conceptual grounds. By choosing to elect an alternative model fit, in addition to being corroborating previous findings, we are undoubtedly contributing to the reinforcement of this idea in upcoming contributions to the MIDG framework. We therefore assume our theoretical option acknowledging how sizeable its impact may be into the shaping of later works.

Most the aforementioned findings may suggest a three-staged conceptualization of group development to be closer to reality. Context-dependency is a characteristic of group processes highlighted by Araújo (2011), who pinpoints the need for a transition to occur from the traditional horizontally-oriented conception of group development to a more vertically-oriented interpretation of it, anchored by group processes framed within an integrating developmental vision. Araújo (2011) further stresses that even though processes tend to be read according to developmental stage, up to this point no clear explanation has been given on how the passing across stages occurs, and neither has it regarding the exact requirements for this "crossing over" to take place. These questions may warrant further analysis in future research centering on the MIDG.

It would be important to further explore EDG-D's psychometric attributes, both because it would be relevant to seek increased robustness in the properties identified in the scope of this study, and because this would allow for the collecting of additional arguments, should a change in the number of stages of the existing model be ultimately proposed. Such endeavor would also reinforce the overall usefulness and legitimacy of the MIDG framework in addressing group development and its underlying group

processes, and validation efforts concerning competing and complementary instruments derived from this model should hence also be undertaken. Favoring instrumental diversity and increased applicability is certainly one of the ways through which one can hope to achieve a higher degree of impact for organizational and psychological sciences, both in academia as well as within the boundaries of applied science.

Chapter 6: Conclusions

Our study had the objective of putting to the test the psychometric capabilities of the EDG-D, an instrument developed by N. Pinto (2012) intended to assess group's current stage of development following the theoretical guidelines prescribed by the MIDG framework (Miguez & Lourenço, 2001).

In order to attain this objective, we were required to undertake several steps. Firstly, a careful review of existing literature concerning the group development theoretical body was in order. After that, a similar process ensued concerning the MIDG, its previous developments and its advancements based on the studies that used it. Finally, we analyzed past research addressing studies comparable to ours, focusing on different versions of instruments in anyway related to the appraisal of group development and sharing fundamental conceptual grounds affiliated with MIDG.

We believe we have reached our objective. After submitting our instrument to the statistical set of tests, it is our belief that this scale gets out reinforced in its psychometric attributes. Overall, EDG-D showed very solid figures while undergoing the multiple statistical analyzes concerning its validity and reliability. The final model configuration based on a three-dimensional structure has high interpretability – it furthermore closely resembles findings from previous research – and acknowledges EDG-D as an instrument with discriminant power to assess group development in sports teams. Moreover, additional testing to measurement invariance with various versions of increasingly constrained models further reinforced the construct validity of this scale, by proving that it has, also, good temporal stability.

The emergence of a tri-factorial model – in line with previous findings – leaves us with some interrogations concerning what factorial structure better describes the developmental process in groups. The question concerning whether this configuration actually represents the true nature of group development – hence, demanding a reconceptualization of MIDG – or it is instrument-related only is one that certainly warrants further investigation in future research.

Increased availability of duly validated instruments is an essential condition to useful psychological practice. This is even more so concerning group development, since some authors have identified as a major concern the absence of a reasonable number of instruments in capable condition (e.g., Ito & Brotheridge, 2008). The present study is therefore a valid contribution on that matter. We believe we fulfilled our goals, contributing to the enhancement of EDG-D, and also contributing to enrich the Integrated Model of Group Development.

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Appendix A: Escala de Desenvolvimento Grupal – Desporto (EDG-D) [Group Development Scale – Sport]

ESCALA DE DESENVOLVIMENTO GRUPAL – DESPORTO (EDG_D)

O Presente questionário é parte integrante de um estudo sobre equipas desportivas, destinando-se exclusivamente a fins de investigação.

Pretendemos conhecer a sua opinião sobre o que acontece na sua equipa relativamente a alguns aspectos no ACTUAL MOMENTO. A CONFIDENCIALIDADE e o ANONIMATO das respostas são integralmente garantidas.

Note que não existem respostas CERTAS ou ERRADAS, POSITIVAS ou NEGATIVAS, BOAS ou MÁS.

MODALIDADE DESPORTIVA: **DIVISÃO EM QUE A EQUIPA COMPETE:**

SEXO: **IDADE:** **HABILITAÇÕES LITERÁRIAS:**

NÚMERO DE ÉPOCAS A REPRESENTAR ESTA EQUIPA:

É REMUNERADO PELA PRÁTICA DESPORTIVA NESTA EQUIPA: SIM ☐ NÃO ☐

EM CASO AFIRMATIVO, ESTA É A SUA PRINCIPAL ACTIVIDADE REMUNERADA: SIM ☐ NÃO ☐

INSTRUÇÕES DE PREENCHIMENTO:

- Para cada situação descrita, UTILIZANDO A ESCALA APRESENTADA (1 - 7), coloque UM X NA OPÇÃO QUE CONSIDERE MAIS ADEQUADA tendo em consideração o que acontece ACTUALMENTE na sua equipa. O número 1 significa NÃO SE APLICA e o 7 APLICA-SE TOTALMENTE.

Por favor não deixe nenhuma situação descrita sem qualquer opção assinalada na escala utilizada.

ACTUALMENTE, NA MINHA EQUIPA:	**Não se aplica**						**Aplica-se Totalmente**
1. Os jogadores esperam que as decisões na equipa sejam tomadas pelo treinador.	1	2	3	4	5	6	7
2. O facto de existirem diferentes formas de pensar e de agir na equipa é visto como uma mais-valia pelos jogadores. A equipa encoraja e procura integrar construtivamente essas diferenças.	1	2	3	4	5	6	7
3. O papel que cada jogador desempenha na equipa é claro e aceite por todos. Os jogadores conversam regularmente sobre o papel de cada um e são capazes de efectuar reajustamentos de forma autónoma, se tal lhes for permitido.	1	2	3	4	5	6	7
4. Só alguns jogadores participam nas conversas. A maior parte não expressa as suas opiniões, optando por *"jogar à defesa"*.	1	2	3	4	5	6	7
5. Parece que os jogadores são muito parecidos quanto à forma de pensar e de agir.	1	2	3	4	5	6	7
6. Existe um clima tenso e conflituoso em que os jogadores procuram utilizar a sua influência pessoal e o seu estatuto para obter resultados que lhes sejam pessoalmente favoráveis.	1	2	3	4	5	6	7
7. Existe elevada coesão, estando a equipa muito unida em torno das posições do treinador.	1	2	3	4	5	6	7
8. Existem subgrupos que, embora, por vezes, tenham posições diferentes, procuram respeitar-se e adaptar-se para que a equipa funcione bem.	1	2	3	4	5	6	7
9. Existem pouquíssimos conflitos. Os jogadores procuram evitar a todo o custo interacções desagradáveis com os colegas e com o treinador.	1	2	3	4	5	6	7
10. Os jogadores têm formas de pensar e de agir muito diferentes, o que gera mal entendidos e tensões.	1	2	3	4	5	6	7

ACTUALMENTE, NA MINHA EQUIPA:	Não se aplica						Aplica-se Totalmente
11. As normas que regulam a equipa são frequentemente questionadas pelos jogadores (ora por uns, ora por outros), que procuram, a todo o custo, modificá-las.	1	2	3	4	5	6	7
12. Alguns jogadores questionam o papel que lhes foi atribuído na equipa, expressando o seu desacordo e descontentamento, originando momentos de tensão e conflito.	1	2	3	4	5	6	7
13. Existem conflitos, no entanto, na maior parte das vezes, os jogadores tentam geri-los de forma a não prejudicarem o funcionamento da equipa.	1	2	3	4	5	6	7
14. Os jogadores procuram, a todo o custo, participar nas decisões da equipa e fazer valer as suas ideias.	1	2	3	4	5	6	7
15. Existe forte coesão, confiança, proximidade e cooperação entre todos os jogadores, que embora possam ser diferentes entre si, sentem que dependem uns dos outros.	1	2	3	4	5	6	7
16. Os jogadores concordam, no essencial, com o papel que foi atribuído a cada um na equipa. Quando sentem necessidade de o alterar, fazem propostas nesse sentido, num clima positivo.	1	2	3	4	5	6	7
17. Os jogadores conversam com alguma frequência sobre as normas que regulam a equipa e, no geral, aceitam-nas e seguem-nas. Os desvios às normas são aceites se forem vistos como benéficos para todos.	1	2	3	4	5	6	7
18. A coesão é muito fraca, existindo muita tensão, oposição e rivalidades entre os jogadores.	1	2	3	4	5	6	7
19. Existem conflitos, no entanto, os jogadores abordam-nos de forma construtiva, procurando que todos "saiam a ganhar".	1	2	3	4	5	6	7
20. Os jogadores procuram participar nas decisões da equipa, sempre que lhes é permitido, tentando que o resultado das mesmas seja o melhor para a equipa.	1	2	3	4	5	6	7
21. Os jogadores procuram participar nas conversas e expor os seus diferentes pontos de vista, esforçando-se por escutar os dos outros.	1	2	3	4	5	6	7
22. Existem subgrupos que competem entre si e procuram alcançar maior poder dentro da equipa.	1	2	3	4	5	6	7
23. A maioria dos jogadores que participa nas conversas preocupa-se mais em impor os seus pontos de vista do que em conhecer e escutar os dos colegas.	1	2	3	4	5	6	7
24. Existem subgrupos que se relacionam de forma positiva e que são muito importantes para que a equipa funcione bem.	1	2	3	4	5	6	7
25. Os jogadores seguem as normas que regulam a equipa sem as questionar. Este assunto não é, sequer, abordado.	1	2	3	4	5	6	7
26. Os objectivos da equipa são claros são aceites por todos e são conversados de forma aberta.	1	2	3	4	5	6	7
27. Quando se estabelecem os objectivos a alcançar existem desentendimentos entre alguns jogadores.	1	2	3	4	5	6	7
28. Os jogadores debatem aberta e frequentemente as normas que regulam o grupo. Sempre que julgam vantajoso para a equipa, procuram modificá-las. A inovação e a criatividade são encorajadas.	1	2	3	4	5	6	7
29. O papel que é esperado de cada jogador não é discutido. Os jogadores esperam que o treinador lhes diga o que devem fazer e como fazê-lo.	1	2	3	4	5	6	7
30. Os jogadores estão preparados para, quando necessário, tomarem decisões relativas à equipa, de forma autónoma, requerendo apenas o acompanhamento por parte do treinador.	1	2	3	4	5	6	7
31. O esforço de adaptação mútua e de ultrapassar com êxito as divergências que ocorrem, faz com que exista uma coesão crescente na equipa.	1	2	3	4	5	6	7
32. Não existem subgrupos.	1	2	3	4	5	6	7

ACTUALMENTE, NA MINHA EQUIPA:	Não se aplica						Aplica-se Totalmente
33. **Os jogadores esperam que seja o treinador a definir os objectivos da equipa, aceitando-os, mesmo que não concordem com eles.**	1	2	3	4	5	6	7
34. **Os jogadores esforçam-se por respeitar e aceitar, eventuais, diferenças que existam quanto à forma de pensar e de agir dos seus colegas.**	1	2	3	4	5	6	7
35. **Os jogadores conhecem e concordam, no essencial, com os objectivos da equipa e são capazes de os discutir sem gerar tensões e mal entendidos.**	1	2	3	4	5	6	7
36. **Existe um clima de total abertura, onde a participação é encorajada, todos se escutam e partilham as diferentes opiniões, procurando integrá-las.**	1	2	3	4	5	6	7

Appendix B: Description of item captions

Table 10

Description of item captions sorted by stage (36 items).

Factor	Item caption	Description
Stage 1		
Structuring		
	1 (DMP1)	Decision-making processes
	4 (COM1)	Communication as a participation type
	5 (DIFMAN1)	Managing differences among team members
	7 (GC1)	Group cohesiveness
	9 (CONF1)	Conflict and conflict management
	25 (NORM1)	Norms regulating team's functioning
	29 (ROLE1)	Team members' roles
	32 (SUBGROUPS1)	Subgroup existence
	33 (OBJ1)	Defining team's objectives
Stage 2		
Reframing		
	6 (CONF2)	Conflict and conflict management
	10 (DIFMAN2)	Managing differences among team members
	11 (NORM2)	Norms regulating team's functioning
	12 (ROLE2)	Team members' roles
	14 (DMP2)	Decision-making processes
	18 (GC2)	Group cohesiveness
	22 (SUBGROUPS2)	Subgroup existence
	23 (COM2)	Communication as a participation type
	27 (OBJ2)	Defining team's objectives
Stage 3		
Restructuring		
	8 (SUBGROUPS3)	Subgroup existence
	13 (CONF3)	Conflict and conflict management
	16 (ROLE3)	Team members' roles
	17 (NORM3)	Norms regulating team's functioning
	20 (DMP3)	Decision-making processes
	21 (COM3)	Communication as a participation type
	31 (GC3)	Group cohesiveness
	34 (DIFMAN3)	Managing differences among team members
	35 (OBJ3)	Defining team's objectives
Stage 4		
Realization		
	2 (DIFMAN4)	Managing differences among team members

3 (ROLE4)	Team members’ roles
15 (GC4)	Group cohesiveness
19 (CONF4)	Conflict and conflict management
24 (SUBGROUPS4)	Subgroup existence
26 (OBJ4)	Defining team's objectives
28 (NORM4)	Norms regulating team's functioning
30 (DMP4)	Decision-making processes
36 (COM4)	Communication as a participation type

Appendix C: Reliability (36 items' model configurations)

Table 11

Factorial analysis and reliability values: factorial internal consistency, items' coefficients of correlation and item total correlations (r) [t1; tetra-factorial model, 36 items].

Factor	Item	Factor Loadings	R^2	Item Total correlation	Cronbach's alpha value (α)
Stage 1 *Structuring*					.943
	1 (DMP1)	.730	.533	.723	
	4 (COM1)	.783	.613	.764	
	5 (DIFMAN1)	.832	.692	.802	
	7 (GC1)	.761	.580	.743	
	9 (CONF1)	.812	.660	.787	
	25 (NORM1)	.794	.631	.758	
	29 (ROLE1)	.837	.700	.814	
	32 (SUBGROUPS1)	.855	.731	.828	
	33 (OBJ1)	.856	.733	.823	
Stage 2 *Reframing*					.954
	6 (CONF2)	.878	.771	.848	
	10 (DIFMAN2)	.822	.676	.802	
	11 (NORM2)	.838	.702	.821	
	12 (ROLE2)	.797	.635	.781	
	14 (DMP2)	.768	.590	.747	
	18 (GC2)	.904	.817	.870	
	22 (SUBGROUPS2)	.880	.774	.857	
	23 (COM2)	.834	.696	.821	
	27 (OBJ2)	.800	.640	.785	
Stage 3 *Restructuring*					.940
	8 (SUBGROUPS3)	.756	.571	.727	
	13 (CONF3)	.725	.525	.712	
	16 (ROLE3)	.799	.638	.788	
	17 (NORM3)	.808	.653	.792	
	20 (DMP3)	.831	.690	.786	
	21 (COM3)	.858	.736	.825	
	31 (GC3)	.820	.672	.777	
	34 (DIFMAN3)	.767	.588	.741	
	35 (OBJ3)	.808	.653	.783	

Stage 4 *Realization*					.862
	2 (DIFMAN4)	.627	.393	.612	
	3 (ROLE4)	.596	.356	.582	
	15 (GC4)	.408	.166	.373	
	19 (CONF4)	.713	.508	.650	
	24 (SUBGROUPS4)	.673	.453	.579	
	26 (OBJ4)	.669	.447	.598	
	28 (NORM4)	.763	.582	.702	
	30 (DMP4)	.577	.333	.543	
	36 (COM4)	.722	.521	.670	

Table 12

Factorial analysis and reliability values: factorial internal consistency, items' coefficients of correlation and item total correlations (r) [t1; tri-factorial model, 36 items].

Factor	Item	Factor Loadings	R^2	Item Total correlation	Cronbach's alpha value (α)
Stage 1 *Structuring*					.943
	1 (DMP1)	.728	.531	.723	
	4 (COM1)	.782	.612	.764	
	5 (DIFMAN1)	.829	.688	.802	
	7 (GC1)	.761	.579	.743	
	9 (CONF1)	.811	.658	.787	
	25 (NORM1)	.796	.634	.758	
	29 (ROLE1)	.838	.702	.814	
	32 (SUBGROUPS1)	.855	.732	.828	
	33 (OBJ1)	.859	.738	.823	
Stage 2 *Reframing*					.954
	6 (CONF2)	.878	.771	.848	
	10 (DIFMAN2)	.823	.677	.802	
	11 (NORM2)	.838	.703	.821	
	12 (ROLE2)	.797	.636	.781	
	14 (DMP2)	.766	.587	.747	
	18 (GC2)	.904	.817	.870	
	22 (SUBGROUPS2)	.880	.774	.857	

	23 (COM2)	.835	.697	.821	
	27 (OBJ2)	.799	.639	.785	
Stage 3/4 *Restructuring/ Realization*					.949
	2 (DIFMAN4)	.604	.365	.612	
	3 (ROLE4)	.570	.325	.582	
	8 (SUBGROUPS3)	.753	.567	.727	
	13 (CONF3)	.721	.520	.712	
	15 (GC4)	.402	.162	.373	
	16 (ROLE3)	.795	.633	.788	
	17 (NORM3)	.809	.654	.792	
	19 (CONF4)	.702	.493	.650	
	20 (DMP3)	.834	.695	.786	
	21 (COM3)	.857	.734	.825	
	24 (SUBGROUPS4)	.679	.461	.579	
	26 (OBJ4)	.643	.414	.598	
	28 (NORM4)	.731	.534	.702	
	30 (DMP4)	.553	.306	.543	
	31 (GC3)	.817	.668	.777	
	34 (DIFMAN3)	.761	.580	.741	
	35 (OBJ3)	.805	.649	.783	
	36 (COM4)	.688	.474	.670	