

# **Group development and team learning: How development stages relate to team-level learning behaviour**

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## **Abstract**

Teams need to go through a series of development stages before they can operate effectively as a team. It has also been demonstrated that in a changing context, teams need to keep on learning in order to remain effective. This article aims to study the relationship between team development and team learning. Which development phases are characterised by basic team learning processes such as sharing information, co-construction and constructive conflict, and why? It is hypothesised that, although each stage of team development is characterised by specific learning tasks, team-learning processes occur more in some stages than in others. Results from a model-based cluster analysis and ANOVA analyses on a sample of 44 professional teams show that teams learning occurs more in the trust and structure phase, and in the work phase, than in the two earlier phases of group development due to higher levels of team psychological safety and group potency.

## **Keywords**

Team learning; Group development; Group potency; Psychological safety

## **Introduction**

London and Sessa (2007) have stated that due to the importance of team and group work within organisations, “group development and facilitation are an important part of human resource development” (p. 353). In her literature review Bonebright (2010) also argues that group development has been an important topic within human resource development both within practice as within the academic literature. Within the field of human resource development several researchers have argued on a conceptual level that team learning, readiness to learn of teams and a continuous professional development of team members contribute to the development of the group, the social relations within the group, the effectiveness of the team, the team’s ability to solve problems (Edmondson, 2012; Hall, 2007; London & Sessa, 2007; Marquardt, Seng, & Goodson, 2010). Hall (2007) states that within continuously changing environments “it may be that a team’s ability to develop and learn may be most critical for high performance” (p. 422).

Both team learning and group development research start from the premise that teams or groups will not be effective, unless they collaboratively learn to overcome barriers such as team dictators (West & Markienwicz, 2004), free riding (Wagner, 1995), social loafing (Karau & Williams, 1993; West, 2004), ego-trippers (Lencioni, 2002), a lack of team psychological safety (Edmondson, 1999). However, although the point of departure for both literatures is the same, their focus seems to be different. Team learning literatures focus on how behaviours such as giving feedback, sharing information, boundary crossing, team reflexivity, experimentation affect the construction of shared mental models and team effectiveness (e.g., De Dreu, 2007; Edmondson, Bohmer, & Pisano, 2001; Savelsbergh, Storm, & Kuipers, 2008; Van den Bossche, Gijsselaers, Segers, & Kirschner, 2006; Zellmer-Bruhn & Gibson, 2006). These authors theorise that because of an increasing emphasis on

knowledge, a changing environment and increasing knowledge inflation, team learning is becoming an important variable in predicting team effectiveness. Group development literature similarly addresses the question of how groups become effective over time (Tuckman & Jensen, 1977; Wheelan, 2009). However, the difference is that the emphasis in team learning studies is on examining whether and why certain input variables predict variance in specific team learning processes and outcomes, whereas group development studies are rather focused on describing how and why groups mature over time.

Noteworthy is the conceptual confusion between *team* learning and *group* development. Even though the terms 'team' and 'group' are often used interchangeable (Cohen & Bailey, 1997), they can also refer to something different. Research on team learning is mainly focused on teams that comply with the definition of Cohen and Bailey (1997, p. 242): "*A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries*". A group can be defined as a collection of individual who perform similar or complementary tasks as different individuals (Gilley & Kerno, 2010). However, research on group development can be applied to a wide range of groups (e.g. therapy groups, sport groups), but still seems to focus on a smaller niche of groups than the ones defined by Gilley and Kerno (2010): namely groups that have a common goal. That is why the theory of group development is generalized to teams in this study. In this study, the focus is on teams as defined above. Only when references to the group development model of Wheelan (2005) are made, the term group is used.

Despite of the different focus of team learning and group development literature, it was nevertheless surprising to see that there is virtually no empirical research which crosses the

gap between these two distinct fields of research (Decuyper, Dochy, & Van den Bossche, 2010). After all, boundary crossing questions such as ‘To what extent does group development also serve units to be capable of *learning* effectively as a team?’ or ‘How do different development stages relate to team learning behaviour?’ are increasingly gaining importance in the light of an increasing emphasis on knowledge, creativity and innovation. A case in point is the suggestion of Kasl, Marsick and Dechant (1997) that group development does not guarantee collective learning. They state that “Teams can work their way through the developmental stages of forming, storming, norming and performing (Tuckman, 1965), yet never challenge dysfunctional assumptions or create new knowledge through strategies such as framing or perspective integration.” (p. 231). Therefore, in addition to research that empirically studies the link between group dynamics and *teamwork*, there is also a necessity for empirical research that links group development to team *learning* (Ilgen, Hollenbeck, Johnson, & Jundt, 2005).

The objective of this study is to explore the relation between group development and team learning by combining the group development model of Wheelan (2005) with the team learning development model of Dechant, Marsick and Kasl (1993). Due to the dynamic nature of teamwork team learning behaviours evolve over time (Van der Haar, et al., 2013) and thus over different stages of group development. We strive to answer following question: to what extent basic team learning behaviours such as constructive conflicts, co-construction and sharing information come about in multiple development phases? Secondly, it is generally accepted that social conditions for team learning evolve over the different development phases (e.g., Arrow & Cook, 2008; Sweet & Michaelsen, 2007), however little empirical research exist that confirms this statement. In this study the focus will be on two catalyst emergent states ‘*team psychological safety*’, which is the shared conviction that the team is

safe for interpersonal risk-taking (Edmondson, 1999), and *group potency*, which is the collective belief of team members that the team can be effective (Shea & Guzzo, 1987). Both are social conditions that have been modelled as the social basis for effective teamwork and effective team learning (Boon, et al., 2013; Edmondson, 2003; Van den Bossche, et al., 2006). It is hypothesised that the state of these social conditions over time is important for explaining the relationship between group development and team learning. Concretely, the question whether psychological safety and group potency are higher when group are situated in the later stages of group development will be answered? If this is the case, it can be expected that team learning behaviours will also be higher (e.g., Brousseau 1997; Edmondson, 2002; Van den Bossche et al., 2006) and that psychological safety and group potency explain the relationship between group development and team learning.

### **Theoretical background**

In this section the focus will first be on group development and on team learning. Then, the link between them based on a model of Dechant et al. (1993) is illuminated. Finally, the literature on psychological safety and group potency is discussed.

#### *Group development*

Since the pioneering work of Bennis and Shephard (1956) researchers have increasingly been concerned with modelling group development over time. The purpose of modelling group development is increasing the understanding of internal communication systems in order to improve them. In their literature review Chidambaram and Bostrom (1996) showed how group development researchers tend to describe the development of groups either in a sequential (e.g., Bennis & Shepard, 1956; Hill & Gruner, 1973; Kaplan & Roman, 1963; Tuckman, 1965; Tuckman & Jensen, 1977) or in a non-sequential way (e.g., Gersick 1991;

McGrath, 1991). Researchers from the sequential tradition tend to posit unitary sequences of development that groups pass through during the course of their lives, whereas researchers from the non-sequential tradition propose no predetermined sequence of events; instead, they focus on explaining the underlying factors that cause shifts in group development.

This study uses the group development model of Wheelan (2005). It describes the maturation of groups in terms of developing through four stages: dependency and inclusion, counter-dependency and fight, trust and structure, and work and termination. Although essentially it is a life cycle model it integrates elements from both sequential and non-sequential theories (Sweet & Michaels, 2007; Wheelan, 2005). **This integration was a most important reason to select this model as a heuristic framework.** Another of its mayor strengths is that, in contrast to most other development models, this model has been empirically validated in a number of studies working with employees of various organisations and sectors (Wheelan, 2009; 2005; Wheelan, Davidson, & Tilin, 2003; Wheelan & Hochberger, 1996; Wheelan & Mckeage, 1993). **This model describes the group development that leads to the creation of an organised unit capable of working effectively as a team.**

*Phase 1: Dependency and inclusion:* This phase is marked by high anxiety, uncertainty, and politeness. **Team members are concerned with issues like being accepted, uncertainty reduction,** boundaries and they will therefore tend to defer to a 'leader' and to be defensive.

*Phase 2: Counter dependency and fight:* This phase is marked by conflict, power struggles, search for identity and definition of roles. A social structure within the team is still being developed. Hence, the full resources are not yet available for application to the task.

*Phase 3: Trust and Structure:* This phase is marked by more mature negotiation processes, team goals, organisational structure, procedures, roles and division of labour.

Consequently information is shared more freely and many more opportunities to learn arise.

*Phase 4: Work and Termination:* This phase is marked by team members feeling comfortably, habitual sharing of information. There is a good sense of where the knowledge and expertise lies within the group. Towards the end of the group's life there can be, however, an increased general awareness, growing team instability, and even conflict.

When using this model of Wheelan (2005), it is important to keep Homan's (2001) criticism in mind that group development models create the illusion that the group development follows fixed patterns, while it is in fact a highly unpredictable, complex and chaotic process. However, although Wheelan's model (2005) clearly assumes a sequential pattern, it acknowledges the complexity and unpredictability of group development: "Groups, like people, seem to advance and retreat, sometimes taking one step forward and two steps backward. Other groups may remain in a stage for extended periods of time. Again, like people, not all groups reach maturity" (Wheelan, 2005, p. 15).

#### *Team learning behaviour*

Recently, team learning has increasingly received attention from small group researchers (Edmondson, Dillan, & Roloff, 2007; Sessa & London, 2008; Van den Bossche et al., 2006; Wilson, Goodman, & Cronin, 2007). In a recent review it is argued that any integrative conceptualisation of the 'team learning' construct should include both team learning processes and team learning outcomes (Decuyper et al., 2010). Consequently, team learning is defined as "a compilation of team-level processes that circularly generates change or improvement, primarily at the level of the team, and secondary at the level of individuals or the organisation.

Being a compilation, it consists of changing combinations of different types of processes (sharing, co-construction, constructive conflict, team reflexivity, boundary crossing, team activity, storage and retrieval). Working circularly, it dynamically translates a complex body of influences from multiple levels (e.g. team, organisation) into different types of outputs at multiple levels, which in turn influence team learning ” (Decuyper et al., 2010, p. 128).

There is sufficient empirical evidence that team learning behaviours indeed lead to mutually shared cognition and increased team effectiveness (e.g., Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001; De Dreu, 2007; Savelsbergh et al., 2008; Van den Bossche et al., 2006; Van Offenbeek, 2001; Van Woerkom & Croo, 2009; Zellmer-Bruhn & Gibson, 2006). In this study the focus will be on three basic team learning behaviours: sharing, co-construction, and constructive conflict (Decuyper et al., 2010). These processes are considered “basic team learning processes because they describe what happens when teams learn” (Decuyper et al., 2010, p. 117), they result in change and are responsible for the power of team learning (Decuyper et al., 2010). ‘*Sharing*’ is a first basic team learning process. By means of sharing, teams enlarge their level of shared knowledge and their awareness of ‘who knows what’ within the team (Wilson et al., 2007). Second, ‘*Co-construction*’ is about team members listening to each other and mutually refining, building on, or modifying each original offer (Baker, 1994; Van den Bossche et al., 2006). Finally, ‘*Constructive conflicts*’ are elaborated discussions in which diversity surfaces. Constructive conflicts start from open communication and lead to further communication and some kind of temporary agreement (Van den Bossche et al., 2006).

#### *Team learning during the development of the team.*

To our knowledge, there are currently no studies focussing on team learning over time empirically. Some models do combine the concept of team learning and team development

theoretically (Ellis, Porter, & Wolverton, 2008; Hall, 2007; Kozlowski & Bell, 2008; London & Sessa, 2007; Marquardt et al., 2010). A good example is the model of Dechant, et al. (1993). They argue that team learning develops over four stages. Dechant, et al. (2010) describe the development of team learning as a process that starts with the fragmented learning stage, where learning only takes place at the individual level, in which every team member is learning individually and building an individual mental model, through the pooled learning stage where little groups within the team learn together. During this stage, sharing of interests and knowledge starts within little subgroups. During the synergetic learning stage where the team members learn as a team, share and build knowledge based on their individual knowledge and on mutual knowledge of the team. To finally arrive at the continuous learning stage where this form of learning as a team becomes a normal process

These four stages can be linked theoretically to the four development phases of Wheelan (2005). In the *dependency and inclusion phase* (1) team members choose their behaviours based on vague assumptions concerning group goals, stereotypes about how other team members will respond. In light of the focus on inclusion, groups in this phase will not likely engage in socially risky team learning behaviours. Sharing information, asking questions, co-construction and constructive conflicts pose a significant threat for one's social inclusion or group membership (Edmondson, 1999; 2002). Consequently, decisions just seem to occur, they are not discussed at all and frequently made without the awareness of any of the group members. The first development phase seems to blend in well with the '*fragmented learning stage*', where the team does not learn as a team, but as individuals. Each individual has its own opinion, and the concern for individual acceptance exceeds the concern for team success. In the *counter dependency and fight phase* (2) there is a struggle for power, a quest for identity, the definition of roles and a first ride towards specialization. Team members know each other better and start to express their ideas and opinions in a less subtle way. Conflicts

emerge, but they are either seen as a personal rejection, instead of a difference in interpretation, or taken as a paradox where one or more elements need to be ignored in order to solve the conflict. In both cases, conflicts are not constructive (De Dreu & Weingart, 2003). Members share frustrations concerning each other's behaviour, and subgroups based on these frustrations can react oppositely and emotionally towards other subgroups (De Dreu & Weingart, 2003).

Similarly, Dechant et al. (1993) suggest that in a second *pooled learning stage*, individuals share information and perspectives and parts of the team learn together in subgroups of team members, but the team as a whole still does not learn. Before teams can engage in constructive conflicts as teams, they need to be able to combine confrontation with listening and considering each other's point of view (Kasl et al., 1997).

In the *trust and structure phase* (3) team members start to trust each other and increasingly succeed in negotiating and organizing at the level of the team. Trust is described as one of the basic ingredients for team learning (Lee, Gillespie, Mann, & Wearing, 2010; Songkram, 2008). Hanpanich (2003) suggests that trust leads to collaborative learning and knowledge sharing. Welch (2004) adds that it also leads to improved creativity, conflict management, teamwork and leadership. Also, Wu, Yeh, and Huang (2007) suggest that trust is the basic condition for effective knowledge sharing and team learning. When team members start to trust each other, expressed disagreements are no longer taken as personal rejections. Rather, such socially risky expressions are taken as signs of concern for the benefit of the collective and taken up as issues that need further attention. Overt disagreement is at this point no longer causing the end but rather the beginning of more and deeper team-level communication (Hogan & Tudge, 1999). In line with the model of Wheelan (2005), Dechant et al. (1993) states that in a third *synergistic learning stage*, the team as a whole learns. Team knowledge is integrated into individual meaning schemes and individual knowledge is integrated in shared

norms.

Finally, the *work and termination phase* (4) is characterised by performance, productivity, decision-making and solving problems. Throughout time, social boundaries are relatively fixed, relational consternations occur less frequently, and there is some kind of established equilibrium. The group is used to and capable of dealing with conflicts and engaging in team learning behaviours. It has an open communication structure in which all members participate and task related deviance is tolerated. The team receives, gives and utilises feedback about its effectiveness and productivity, it encourages innovation and it spends enough time discussing the problems and decisions it faces (Wheelan, 2005). This state blends in with the *continuous learning stage*, where team learning becomes the normal way of learning. A schematic overview can be found in Figure 1. This theoretical link between both models suggests that the team will learn more and more as a team when it goes through the different stages of group development. Since there is no validated questionnaire to test the team learning development phases of Dechant et al. (1996) team learning is operationalized by the basic team learning behaviours (Decuyper et al., 2010) in this study. The occurrence of more basic team learning behaviours means that the team is learning more as a team. Considering the frameworks outlined above, the following hypothesis is stated:

*H1: Teams situated in phase 3 & 4 team will present more team learning behaviours than teams situated in phase 1 & 2.*

#### *Group development and social conditions for team learning*

Social conditions are important defining elements in the description of most group development models (e.g. trust in the model of Wheelan). Similarly, in current team learning models they play an important role in predicting team learning processes and outcomes (e.g., model of Van den Bossche et al., 2006. Different researchers refer to these social conditions

as catalyst emergent states (Decuyper, et al., 2010) or team emergent states (Du Chanténier, Versteegen, Biemans, Mulder, & Omta, 2009; Marks, Mahieu, & Zaccaro, 2001). These states are ‘cognitive, motivational, and affective states of teams [that are] ... dynamic in nature and vary as function of team context, inputs, processes, and outcomes’ (Marks, Mahieu, & Zaccaro, 2001, p. 357). Because of their dynamic nature, it is hypothesised that they will change over the development of the team and thus influence the occurrence of team learning behaviours differently in different phases of development. However, although it is generally accepted that social conditions for team learning evolve over different developmental stages, there is little if any empirical research in authentic situations to confirm this statement (Arrow & Cook, 2008; McGrath, Arrow, & Berdahl, 2000; Sweet & Michaelsen, 2007). That is why two important team emergent states are included in this study: team psychological safety and group potency. It is hypothesised that psychological safety and group potency will increase as teams go through the different development stages.

Team psychological safety is defined by Edmondson (2004, p. 241) as “a team-level concept describing individuals’ perceptions about the consequences of interpersonal risks in their work environment. It consists of taken-for-granted beliefs about how others will respond when one puts oneself on the line, such as by asking questions, seeking feedback, reporting a mistake, or proposing a new idea”. Team psychological safety is one of the most important predictors of team learning behaviour, as every study examining its effect on team learning showed a positive and significant relationship (e.g., Brousseau, 1997; Day, Gronn, & Salas, 2004; Edmondson, 1999; 2002; Edmondson et al., 2001; Knapp (2010), Van den Bossche et al., 2006). Moreover, the importance of psychological safety is stressed in almost every group development model (Chidambaram & Bostrom, 1996). Wheelan (2005, p. 61) emphasises how in the dependency and inclusion phase, team members are ‘concerned with personal safety, acceptance and inclusion, and they fear rejection (Wheelan, 2005, p. 61). Team

members are preoccupied with being accepted by the other team members, could lead to a lack of team psychological safety, and a decrease of team learning behaviour. Phase 2, is predominantly characterised by “hostility” (Wheelan, 2005, p. 62) and “tension” (p. 63). Due to reduced anxiety and concern for inclusion, the existing latent differences surface. However, due to a lack of trust they lead to destructive conflicts, overt power twists and dissatisfaction, which is likely to decrease team psychological safety and team learning behaviour. In phase 3, team members start to trust each other and respect is restored (Wheelan, 2005). The presence of trust plays a central role in the occurrence of team learning (Gubbins & MacCurtain, 2008). Finally, phase 4 is all about solving problems, taking decisions and being a productive team. Several authors show that it is not possible to do so properly without an atmosphere of team psychological safety (Edmondson, 1999; Van den Bossche et al., 2006). Group development models focus on the development of trust, but even though trust and team psychological safety are two distinct concepts (see Edmondson (2002) for a more elaborate discussion of the difference between them) they also have a lot in common, both involve “perceptions of risk or vulnerability and making choices to minimise negative consequences, and both have potential positive consequences for work groups and organisations” (Edmondson, 2004, p. 243). It is therefore hypothesised that in phase 4 team psychological safety increases.

*H2: Team psychological safety will be higher in teams situated in phase 3 & 4 than in teams situated in phase 1 & 2.*

Besides psychological safety, prior research has shown the importance of group potency for team learning (Van den Bossche et al., 2006). Group potency is defined by Shea and Guzzo (1987, p. 26) as “The collective belief of group members that the group can be effective”. It refers to a more general level of shared confidence in the abilities of the team. Sundström, McIntyre, Halfhill, and Richards (2000) and Shelton, Waite, and Makela (2010) state that

group potency is one of the most important predictors of team effectiveness. Previous research has demonstrated that group potency is a good predictor of team learning behaviour even when team psychological safety is taken into account (Van den Bossche et al., 2006).

Moreover, as group potency is also something that evolves during group development (Jung & Sosik, 2003) the construct is used in this study to explain the relationship between group development and team learning. In line with our hypotheses on team psychological safety, it is expected that teams will only start to share a positive believe in the capabilities of the team in phase 3. In phase 1 and 2 team members have first unexpressed doubts and then expressed doubts when it comes to the capabilities of fellow team members/ the team. This results respectively in testing the water behaviour and overt deconstructive conflicts. At the point where they start developing shared trust, shared norms for further interaction and shared plans, they also start to develop a shared belief in the potency of the team (Jung & Sosik, 2003).

*H3: Group potency will be higher in teams situated in phase 3 & 4 than in teams situated in phase 1 & 2.*

The focus of this article is the differential effect of multiple development phases on team learning behaviour. Moreover, the concepts team psychological safety and group potency are used to explain these relationships. Based on the theoretical explanation above, it can be stated that the more a team is developed, the stronger the presence of psychological safety and group potency, the more team learning behaviours are exerted. It will be investigated if the relationship between the development phases and team learning behaviours when psychological safety and group potency are introduced as covariates. The arguments provided above, lead us to hypothesize the following:

*H4: Psychological safety and group potency will mediate the relationship between*

*development phases and team learning behaviours.*

## **Methodology**

### *Sample*

A first step in our data collection consisted of contacting directors or human resource managers of the organisations by e-mail. After agreeing to participate, they provided contact data of one team leader. This team leader was contacted, and together it was determined whether the characteristics of his or her team matched our definition of ‘team’: “A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and are seen by others as a social entity embedded in one or more larger social systems (...), and who manage their relationships across organizational boundaries.” (Cohen & Bailey, 1997, p. 241). All teams are groups, as team members share a common social categorisation and identity. However, only teams are interdependent in respect of a certain task and outcome (e.g., Decuyper et al., 2010; Erhard, 2011). If the ‘team’ requirement was met, team members received via e-mail a link to our on-line questionnaire, together with a personal team number.

In total data were collected from 168 individuals ( $n_i$ ) working in 44 teams ( $n_t$ ) active in different professional contexts (e.g. animal nutrition, oil supply, hospital, high school) on specific tasks (board of directors, service team, management team, sales team, etc.). The average total team size was 8.5 and for all participating teams at least 20% of the team members – with a minimum of 2 – had filled out the questionnaire. This was possible since team-level constructs were measured in which different individuals in the teams can be seen as repeated measures (Van den Bossche et al., 2006, p. 503). The average response rate within the teams was 61% (Table 1). Finally, the average age of participating team members was 46,

on average team members had been active in their team for 5 years ( $SD = 5$ ), and 81% of team members that completed the questionnaire were female.

### *Instruments*

Psychological safety, group potency and team learning behaviours are measured using scales from the 'Team Learning Beliefs & Behaviours-Questionnaire' (TLB&B-Q; Van den Bossche et al., 2006). The four different development phases were measured using items derived from a tool for assessing group processes and development provided by Wheelan (2005). All scales were administered in the native language of the participants (Dutch) using a seven point Likert scale. The TLB&B-Q has been developed in Dutch (Van den Bossche et al., 2006). The items from Wheelan's (2005) tool to assess group processes and development were translated according the guidelines of the International Test Commission (Hambleton, 1994). An English translation of all the items can be found in Appendix 1.

*Team learning behaviour.* Our conception of basic team learning behaviours mainly focuses on conversational actions that allow team members to become partners in the collaborative construction of mutually shared cognition (Roschelle, 1992). These conversational actions refer to the three aforementioned aspects of the learning behaviour (sharing information or construction, co-construction and constructive conflict), which were measured using nine items from the TLB&B-Q (based on questionnaires of Edmondson, 1999; Van Offenbeek 2001; Visschers-Pleijers, Dolman, & Wolfhagen, 2003). Items are for example: 'Team members elaborate on each other's information and ideas' or 'If something is not clear, we ask each other questions'.

*Team psychological safety.* To measure team psychological safety a scale with seven items of Edmondson (1999) was used, which is also included in the TLB&B-Q (Van den Bossche et al., 2006). (E.g., **It is safe to take a risk on this team**).

*Group potency.* Group potency was measured with a scale of six items that was previously used by Sargent and Sue-Chan (2001), Gibson, Randel, and Earley (2000) and Van den Bossche et al. (2006). (E.g., **This team believes it can be very effective**).

*Group development.* To measure the different group development phases as conceptualised by Wheelan's (2005) integrating group development model, a selection of items from the Group Development Questionnaire (Wheelan & Hochberger, 1996) was made. Items were selected by means of a content analysis based on the core characteristics of the different dimensions in our theoretical framework. The resulting questionnaire counted 20 items instead of the original 60 items in the Group Development Questionnaire (Wheelan & Hochberger, 1996).

Phase 1: Dependency and Inclusion: The five items measuring phase 1 focused on the amount of energy a team spends in dealing with issues of dependency and inclusion (e.g., **we haven't discussed our goals very much in this team**).

Phase 2: Counter-dependency and Fight: The four items measuring phase 2 focused on conflict, counter dependency and other characteristics associated with the storming phase of group development (e.g., **Team members seem to have very different views about how things should be done in this group**).

Phase 3: Trust and Structure: The five items measuring phase 3 focused on the amount of trust and structure present in the team (e.g., **This team is able to form subgroups, or subcommittees, to work on specific tasks**).

Phase 4: Work and Termination: Groups who pass through the previous three phases constructively, reach the fourth 'performing, work and termination phase'. These six items

focus on the fact that teams act effectively on their decision in a way all members agree upon (e.g., This team acts on its decisions).

### *Aggregation*

Aggregating the scores of the individuals to the level of the team was necessary because the measured constructs are only meaningful at the level of the team. Moreover, one of the criteria for using parametric data analysis techniques such as correlation and analyses of variance is that the elements are conceptually independent. When team members are asked to score, for example, the occurrence of constructive conflict in their team, the individual scores per team are not independent. In order to aggregate individual responses to team level constructs, it is necessary to check whether the responses of the different team members are related to each other in a sufficient degree. Therefore, the multiple item estimator of the within-group agreement (Rwg) was calculated. When the Rwg is larger than .70 it is acceptable to consider the constructs measured to be situated at the level of the team and to aggregate the responses of the individual team members (James, Demaree & Wolf, 1984).

Our analyses showed a mean Rwg of .79 for team psychological safety, .90 for group potency, .95 for team learning behaviour, .85 for phase 1 & 2, and .96 for phase 3 & 4. These mean Rwg's justify the creation of a group-level-data-set.

### *Data analyses*

Since items were translated and selected from multiple questionnaires, the analyses were started with several exploratory factor analyses (maximum likelihood – Varimax rotation) to assess the underlying structure of the data. A first factor analyses was performed on the items measuring our dependent variable team learning behaviours. A determinant of .006, a KMO measure of sampling adequacy equalling .895 and a significant Bartlett's test of sphericity

( $p < .001$ ) show that these data are suited for this type of analyses. The second factor analysis was performed on the instrument measuring the four development phases of Wheelan's (2005) model. For this second factor analysis, data were also suitable (Determinant = .000, KMO = .891, Bartlett's:  $p < .001$ ). The third and final exploratory factor analysis was performed on the items measuring group potency and psychological safety. The adequacy of the data was shown by a determinant of .020, a KMO measure of .853 and a significant Bartlett's test ( $p < .001$ ). Following, the internal consistencies of the scales were checked by calculating the Cronbach's  $\alpha$  coefficients of the scales. All psychometric analyses were executed with the individual participants' responses (Nunally & Bernstein, 1994).

To answer our research questions, several analyses will be performed with the aggregated data. After calculating the descriptive statistics for the data at the team level, correlational analyses will be performed to explore the relations between the different variables. Since this study examines group development at a given point in time by using a development questionnaire with multiple underlying factors, each group received a score on every group development phase. It will be examined if teams can be situated within a certain development phase, a model based cluster analysis will be performed by means of the Mclust package designed for the R software (Fraley & Raftery, 2002; 2006; R Development Core team, 2011). Following ANOVA analyses will be performed to determine whether the teams situated in different phases differ from each other in terms of team learning behaviour, group potency and psychological safety. Finally, an ANCOVA analysis will be performed to investigate the difference in team learning behaviours between the clusters when psychological safety and group potency are considered covariates.

## **Results**

### *The structure and reliability of the data*

The first exploratory factor analyses focused on the dependent variable team learning behaviours. Results of the analysis show that all nine items load significantly on one factor that explains 52.77% of the variance (see also Appendix 1). The internal consistency of the according scale equals .89.

The exploratory factor analysis on the 20 items measuring the group development phases of Wheelan (2005) resulted into two factors that together explain 40.65% of the variance. The first factor explains 23.59% of the variance and contains all items pertaining to phase 3 and phase 4. The internal consistency of the scale including these eleven items equals .88. The second factor explains 17.06% of the variance and contains 8 items that refer to phase 1 or phase 2 of the model. The internal consistency amounts .80. One item was not included since it did not load above .35 on either factor (see also Appendix 1).

The final exploratory factor analysis also yielded two factors. These factors explain 49.61% of the variance. The first factor represents group potency and explains 26.68% of the variance ( $\alpha = .84$ ). The second factor explains 22.93% of the variance and contains five items measuring psychological safety ( $\alpha = .79$ ). One item measuring group potency and two items measuring psychological safety were not included due to loadings below .35 or cross-loadings. It can be concluded that these analyses show that our data represents the theoretical constructs adopted in this study in a valid and reliable way.

#### *Team learning and group development*

The analyses to answer the actual research questions were started with the calculation of the descriptive statistics of the constructs at the team level (Table 2). Following, the correlations between the variables were analysed (Table 3). The results show that phase 1 & 2 correlates negatively with phase 3 & 4, group potency, psychological safety and team learning

behaviours. The correlations among phase 3 & 4, group potency, psychological safety and team learning behaviours were all positive and relatively strong.

To examine whether it was possible to assign teams to the measured development phases, a model based cluster analysis was performed. The analysis showed that a spherical equal volume model with 2 clusters is the best solution that is the model with the lowest Bayesian Information Criterion. The first cluster was characterised by a higher mean score on phase 1 & 2, and a lower mean score on phase 3 & 4 in comparison with the second cluster (Table 4). However it is important to notice that both clusters score higher on phase 3 & 4 in comparison with phase 1 & 2. It can be concluded that cluster 2 is more outspoken situated in the final phases of group development, while cluster 1 is also leaning towards phase 3 & 4 but has at the meantime has more characteristics relating to the first two phases of group development.

In order to provide an answer concerning hypotheses 1, 2 and 3, ANOVA analyses were performed in which we compared the clusters for team learning behaviours, psychological safety and group potency (Table 5). Results showed that cluster 2 ( $M = 5.88$ ,  $SD = .61$ ) characterised by high scores on phase 3 & 4 scored higher on team learning behaviours than cluster 1 ( $M = 5.14$ ,  $SD = .42$ ). These results support our first hypothesis. The second hypothesis was also confirmed since cluster 2 ( $M = 6.07$ ,  $SD = .46$ ) also scored higher than cluster 1 ( $M = 4.68$ ,  $SD = .68$ ) for psychological safety. Analyses also confirmed our third hypothesis. Cluster 2 ( $M = 5.01$ ,  $SD = .69$ ) scored higher for group potency than cluster 1 ( $M = 5.47$ ,  $SD = .53$ ).

Finally, it was analysed whether a difference in team learning behaviours could still be attributed to the difference in the two clusters when group potency and psychological safety

were introduced as covariates in the analyses. Results show that both covariates are significant but that the clusters are not (Table 6). Indicating that psychological safety and group potency partial out the difference between the clusters.

### **Conclusions and Discussion**

The goal of this study was to study how group development and team learning behaviour relate in order to develop our understanding of both concepts simultaneously. Within the human resource development literature, only theoretical and conceptual studies were identified that explored the integration of group development and (team) learning (Hall, 2007; London & Sessa, 2007; Marquardt et al., 2010). The current study contributes to the literature as it examines this integration empirically. More specifically, it was examined to what extent teams exert team level-learning within the different development phases and how the different levels of psychological safety and group potency in the development phases relate to the occurrence of team learning behaviour.

A first important conclusion from this empirical study is the fact that link between group development and team learning behaviour was confirmed for a large part as hypothesised. Results showed that teams foremost characterised by the *trust and structure phase* and *work and termination phase* showed more team learning behaviours than teams with higher scores on the *dependency and inclusion phase* and *counter dependency and fight phase*. This indicates that teams do not yet learn as a team but rather as fragmented individuals in the first two stages of their group development since our definition of team learning requires cooperation amongst team members. This does not contradict the possibility that team members engage in some kind of pooled learning, where they share information, collaboratively construct knowledge, etc. in dyads or subgroups (Dechant et al., 1993).

However, teams situated in the first two phases demonstrate less learning processes at the level of the team in comparison with teams situated in the later phases. In addition, results showed that team members demonstrate more team learning behaviours in the third '*trust and structure*' phase and the fourth '*work and termination*' development phase. In the latter phases teams indeed demonstrate both a synergistic learning stage, where they take their first steps of learning at the level of the team and team learning behaviour feels right but odd, and a continuous learning stage where team learning behaviour has become the normal way of dealing with each other (Dechant et al., 1993).

A second conclusion is that both team psychological safety and group potency are important to understand how groups develop through time, and why teams increasingly engage in team learning behaviour. This conclusion is derived from the fact that when psychological safety and group potency are introduced as covariates, the difference in team learning behaviours based on the clustering in phases is not significant anymore. This suggests that team learning behaviours are higher in the latter phases of group development, because these latter phases are also characterised by higher psychological safety and group potency of which research has shown that they are important predictors for team learning behaviours. More learning could occur in the '*trust and structure*' phase and *work and termination* phase due to the development of a shared belief that the team is safe for inter-personal risk taking and because they believe they are able to achieve their planned goals. However, further research is needed in order to demonstrate a causal relationship and confirm this statement. Generally, our results show that team psychological safety and group potency are important in understanding both how groups develop over time and why teams learn increasingly in phase 3 & 4, in comparison with phase 1 & 2.

Based on these results, it is interesting to discuss the implications for human resource development in terms of facilitating team learning and group development. Taking into account that every team process is unique and unpredictable, some suggestions are made to creating greater awareness of the possible processes. Our empirical study adds to the knowledge about the processes present in teams during their development. For team facilitators such as team leaders, team coaches, and managers it is important to understand these processes. Wheelan (2005) already stated that teams, who are aware of the multiple development phases when they start working together, are able to navigate up to phase 4 faster. In line, with the statement of Wheelan (2005) and the results of the current study, Hall (2007) states that it is important that team leaders explicitly discuss the stages of development with the team members as this may help the advancement through the different development stages which in turn enhances team learning. London and Sessa (2007) also state that a competent human resource development professional can play an important role when teams or groups are not ready to learn yet, they can lead the group in setting their goals and making their planning, and point out opportunities. The current study seems to suggest that in the first phases of group development the ability to learn as a team is not yet present, therefore the above suggested interventions may be most beneficial in the first stages of the group's development. In different phases facilitators can enhance team learning behaviour by focusing on supporting team psychological safety. Previous research of Edmondson (1999; 2002) shows on the one hand that they can do so by being aware that people instinctively try to avoid to be seen as ignorant, incompetent, negative or disturbing. On the other hand, because team members are particularly aware of and influenced by the behaviour and expectations of the leader (Tyler & Lind, 1992), facilitators should exemplify desired behaviour. They should be accessible for and open to questions, show commitment to the team, ask questions themselves, admit mistakes (exert a 'fallibility model'), showing criticism and self-criticism,

and giving and asking feedback. Group potency is also important for team learning and team development. Previous research has shown that in order to generate high levels of group potency, facilitators should give realistic feedback about the current situation, but optimistic feedback about the possibility to achieve the envisioned future. The importance of differentiating the facilitation of teamwork and team learning along the lines of group development has been theorised previously (Zaccaro, Ely, & Shuffler, 2008).

### **Limitations and future research**

The fact that our exploratory factor analyses of the group development phases was not able to distinct between the four phases described by Wheelan (2005) but instead collapsed phase 1 and 2, and phase 3 and 4 into two factors, can be considered a first limitation of this study. However, since the same tendencies were expected for those phases, it does not limit the interpretation of our results. The fact that the factor analyses collapsed both phases indicates that the participants in this study scored the items belonging to both phases in a same manner. One of the possible explanations for this is that in practice – and as a consequence for the participants – it is very difficult to distinct between phases 1 and 2, and between phases 3 and 4. A second limitation of this study is the fact although cluster 1 had higher scores on phase 1 & 2 and lower scores on phase 3 & 4 in comparison with cluster 2, they still had higher scores on phase 3 & 4 than on phase 1 & 2. In other words no profile was obtained that was clearly situated within phase 1 & 2. A possible explanation for that is the fact that on average team members had been working about 7 years in the team, it is likely that the majority of teams had moved beyond the first phases. It would be interesting if future research would work with a stratified sample in which a balance can be obtained between teams in the first phases of group development and teams in the later phases of group development.

Thirdly, the cross-sectional design of this study limits the conclusions of this study. On the one hand a common method variance bias is likely to yield high correlations and inflated R-squares (Rindfleish, Malter, Ganesan, & Moorman, 2008). On the other hand it does not allow to make causal inferences or longitudinal observations. This research should be considered as the first step in exploring team learning over the development of a group. Future research would benefit from gathering data using mixed methods and sources. In addition a longitudinal design would be interesting since it would allow us to follow the actual development of the teams. Doing so it could be possible to analyse how different teams evolve and regress through multiple development phases over time. However, the present study focused solely on the relationship between the group development model (Wheelan, 2005) and the team learning model (Van den Bossche, et al., 2006) to function as a precursor for further longitudinal research on this topic. Also, it is not because a team is already working together for a longer period of time, that it necessarily has achieved a higher level of group development. Therefore, the use of internal observers (e.g. team members, as used in this study) and/ or external observers will remain indispensable.

A fourth limitation is that the fact that the teams consisted of more women than men. Even though the results from research about the effects of gender composition on team research seem conflicting, there is a tendency to state that gender diversity is positive for team work. This was not taken into account in this study.

A last limitation concerns the fact that our study insufficiently accounted for the complexity in team development and team learning. On the one hand, complexity issues of team learning such as the dynamic relationship between team and individual learning and issues of reversed causality were not addressed. On the other hand, complexity issues in group development such as termination and dynamic membership change may have been addressed insufficiently. The 'termination element' was insufficiently dealt with in our design. Nevertheless, it is likely

that a 'termination or adjourning' phase would relate significantly different to team learning behaviour. Moreover, in some teams members had left the team whereas others had entered. Research confirms that for many modern teams, membership changes continuously. This suggests adding a 'transforming' phase between the 'performing' and 'adjourning' phase. Within this transforming phase, teams start a new but shorter sequence of forming, storming and norming. Future research could increase our understanding of how the forming, transforming and adjourning phases relate to trust and team learning.

In the theoretical background of the study it was described that although group development is potentially a very important variable in team learning, it has generally been ignored in empirical research so far (Sweet & Michaelsen, 2007). This study further supports theory of how team learning develops (Dechant et al., 2003) and warrants the continued attention for the development of groups and teams within practice and academic research (Bonebright, 2010). Moreover, it showed that team development relates to team learning mainly due to the development of team psychological safety and group potency.

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#### RESPONSES TO COMMENTS OF THE EDITOR AND REVIEWERS.

1. Define and differentiate between the key terms 'groups' and 'teams' in the introduction (p. 1).

*As suggested by the Editor and Reviewer 1, we added a paragraph about the conceptual confusion of 'groups' and 'teams' within the two streams of research. When we use the terms 'groups' and of 'teams' in this study, we refer to teams as defined by Cohen & Bailey (1997). To avoid confusion, we will use the term team throughout the manuscript, we will only use the term groups when referring to the group development model of Wheelan or group potency, since these concepts have been named like that in literature.*

2. Make the objectives of the research more clear and make it more clear what questions and gaps in the literature the paper addresses. These issues should be addressed in the Introduction.

*As suggested by the Editor and Reviewer 3, we defined the research objectives and questions more clearly in the introduction. We made adjustments and build further on the existing text.*

3. Please update the literature review with more recent references (only 6% of the resources are during the last 5 years).

*As suggested by the Editor and Reviewer 1 & 3, we added more recent references, both from HRD Journals sponsored by AHRD and others (e.g. Educational Research Review; European Journal of Training and Development). The articles that were added are highlighted in the reference list (yellow for HRD Journals sponsored by AHRD & green for others). However, most research on group development and the group development model of Wheelan is dated from 2005 and before. Even the most recent articles refer to the models of Tuckman and*

*Jenssen (1965) or Wheelan (2005). This explains why a considerable number of the references used in this article are older than 5 years.*

4. The first hypothesis is by far the most compelling. You need to strengthen the rationale for the inclusion of hypotheses 2-4 (these are already well evidenced in the literature).

*As suggested by the Editor, Reviewer 2 and Reviewer 3, the rationale for hypotheses 2-4 is strengthened in the text. We added concept catalyst emergent states to explain the changing nature of psychological safety and group potency. Psychological safety and group potency can be seen as catalyst emergent states, in the sense that they are the input for team learning as well as an outcome. Consequently they change all the time and are influenced by other processes present in the team context. Since these catalyst emergent states have been found to be antecedents for the occurrence of team learning, it is of interest to know when in the development of a team these states emerge and how they influence the occurrence of team learning behaviours. Several theoretical reflections have been published on these issues. However the link between the stage of development of a team, the status of psychological safety and group potency, and the amount of team learning processes has never been tested empirically. Therefore this study adds to the literature because it sheds a first light on the dynamic nature of team learning processes, an upcoming issue that has been neglected in literature for several years.*

5. There are several issues of concern in the methods section: 1. What is the context of the organizations contacted? What is the source from which they were derived? Is the population (i.e., the context not currently described) and sample representative [of certain industries?]? In other words, we need more detail on the population, its context and the sample. Is there any evidence of response/non-response bias? 2. Please clarify the characteristics of the sample teams. In particular, (a) do you have data from 1 team from each participating organization? and (b) what percentage of your teams have only 2 members? Be explicit about this and provide a rationale for their inclusion (if included) because the general rule of thumb is that nested/aggregated data should include at least 3 members.

70% of the teams came from companies in the non profit sector (e.g. nursing teams) and 30% were from the profit sector (e.g. management teams, sales teams,).

*We applied the rule that questionnaires of 2/3<sup>rd</sup> of the team members should be included based on James, Demaree, and Wolf, 1984. To our knowledge, different other articles that used this rule have been published (e.g. Boon, et al., 2013; Veestraeten, et al. in press).*

6. Please provide more information about the individual scales used.

*We limited the information about the scales to the absolute minimum due to a lack of space. An attachment is provided at the end of the article with all items of the different scales. Within the manuscript itself, we added examples of items for the different scales. We refer to the articles of Van den Bossche, et al., (2006) and Wheelan & Hochberger (1996) in the text for further information about the instrument.*

7. In terms of the results, currently Table 5 includes ANCOVA results - with no results for

ANOVA. We believe you are missing a Table reporting your ANOVA results. More detail needs to be provided on the logic behind the interpretation of all of the results.

*As suggested by the Editor and Reviewer 1, a table reporting the ANOVA results is added to the text.*

8. As your data are cross-sectional you cannot make any inferences about causal relationships in any of your results (please see Reviewers 2 & 3 for further detail). Verbiage throughout the paper that implies causation must be avoided.

*We agree with the editor and the reviewers on this statement. Any causal inferences are replaced by correlational statements on interrelationships or deleted.*

9. Please also ensure that the standard of language in the revised manuscript meets the high quality required by HRDQ.

#### RESPONSES TO THE REMAINING COMMENTS OF THE REVIEWERS.

10. Reviewer 2: The conceptualization of team development and team learning is correctly seen as a process that occurs over time (i.e., as teams develop their learning behaviors improve) yet the data are cross-sectional and do not permit an adequate test of the relation between development and learning over time. This is disappointing.

*The aim of this study is limited to testing how the group development model (Wheelan, 2005) and the team learning model (Van den Bossche, et al. 2006) are related to each other. We agree on the statement of reviewer 2 and are aware of this fact. However, we think this study can be considered as a good precursor of further longitudinal research in this area. A statement on this issue has been added in the section on future research. In addition, we also discuss this limitation in the paper.*

11. Reviewer 2: The 4-stage model of team learning (Dechant et al.) is conceptually linked to Wheelan's 4-stage model of group development yet team learning is collapsed into a single measure when data were collected (without a good explanation why). This collapsing seems to be into 3<sup>3</sup>basic learning processes<sup>2</sup> developed by Decuyper et al. Yet none of this is clearly explained. I expected to see 4 measures of team development stages and 4 measures of team learning but none of this emerges.

*The model of Dechant et al. (1993) has never been tested empirically, thus no such measure exists of this model. Based on their theory, it can be suggested that more team learning behaviours will occur as the team goes through the stages in the model. That is why we operationalized the team learning model of Dechant et al. (1993) using items to measure team learning behaviors (Van den Bossche, et al., 2006) and hypothesized that more team learning behaviours will occur in later stages of team development. Thus if more team learning behaviours are measured in later phases of development, we can this understand this as endorsement for the model of Dechant et al. (1993). A clarification has been made in the text (p.12 of the manuscript).*

12. Reviewer 2: The three major models of the study identified in #2 above are only briefly explained with little conceptual development of how they fit together. All of this seems a bit contrived and loosely connected. Not thoroughly explained or developed. Ditto for the mediating roles of group potency and psychological safety. These are referred to as 'social conditions' for team learning. How do these differ from group processes? How do they differ from how you have conceptualized development stages and learning stages? Why these social conditions and not others?

*We added different parts in the text to make the connection between the different concepts and models stronger (cfr. Comment 4 above).*

15. Review 2: there is clearly shared measurement error not only in using the same method to collect data but also in the measures themselves. Some of the items of the development phases are similar to the items on the team learning behaviours. For example: "team acts on its decisions" and "comments on ideas are acted upon.". The high correlations in table 3 suggest this overlap. The .81 correlation between phase 3&4 and psych saf and TLB suggest these are measuring essentially the same thing.

*The high correlations between items of validated scales that measure different concepts are present. We suggest further research is needed to develop more appropriate scales to measure the different constructs.*

15. Reviewer 2: The results essentially show that group potency and psych safety wipe out the differences between the two clusters. If so, why do we need the Wheelan and Dechant et al models at all? Why not a single simple hypothesis: the greater the group potency and psych safety, the greater the learning.

*Our rationale for adding the models of Wheelan and Dechant is because these are well known streams of research in the area of research on team work and conceptualize that more mature teams are more effective.*

*It has also been confirmed several times that team learning enhances team performance. Psychological safety and group potency are antecedents of team learning and it is suggested that these processes only occur later in the development of a team.*

*By investigating the relationship between the models of Wheelan and Dechant, the occurrence of psychological safety, group potency and team learning behaviours we try to create a clearer image of the mechanisms that enhance team learning and team effectiveness.*

16. Too, there is a need for significant work in the area of literature review. Authors refer the readers to areas of study that are significant to the topic of the paper, yet do not provide a full list of citations/references to provide rationale (in fact, in several instances, the authors use the expression 'etc.' in citations and areas of interest). This is especially troubling because these areas are not further explored in a literature review section (no literature review section is included in the paper).

*Expressions like 'etc.' are deleted and these statements are complemented with a further exploration of the literature.*

17. Further, authors state that they reviewed HRD literature in this area, however, no mention of management and/or organizational behavior literature is made-it is imperative that literature in these areas are reviewed and addressed within the manuscript.

*Following the suggestions of the Editor to search for more HRD literature on this topic, we deliberately choose to focus and limit our search to literature in the field of HRD. Most relevant literature about the models that are addressed in this study can be found in HRD literature.*

18. Also pressing within Chapter 1 is the lack background that would otherwise help readers to understand why psychological safety and group potency (among the hundreds of other potential group dynamics-related variables) are chosen for this research. Be specific why do you think those are the key variables of interest to study. You do this in later sections of the paper (this should be shortened significantly, and moved up.

*The reason for selecting psychological safety and group potency is that they are identified as the most important antecedents for the occurrence of team learning behaviours. A section is provided in the beginning of the text to state this more clearly (p.5) as well as later in the manuscript as a rationale for hypothesis 2-3-4 (p. 13 for psychological safety and p. 14 for group potency).*

19. In this section, you state that 81% of respondents were female. Yet, you do not address gender in any way throughout the paper. This is important (much is known about the way that gender differences impact group processes) the fact that the vast majority of your participants were females may have a significant impact upon the research, its results, and the conclusions that can be drawn. Be sure to address this.

*We added a paragraph in the limitation section to address this issue. Within the scope of the article, we choose not to focus on this issue.*

20. In looking at the use of the Wheelan scale, what parameters were used to choose the 20 of 60 items in the original scale? This should be discussed further (presuming factor analysis was used to help identify those items that were of greatest interest, please state that). It is important that you help readers to understand why those 20 questions represent group development as well as, or better than, the original 60 questions.

*We selected 20 items out of the original 60 questions of Wheelan's questionnaire with the help of an expert panel. We asked them which items would be most important to grasp the different phases. The reason for this downsize is to shorten the questionnaire in order to make the data feasible and the data more valid as prior research has shown that when participants have to complete very long questionnaires their attention decreases making the measurement of concepts possibly less reliable and valid.*

21. What you describe as an exploratory factor analysis looks much more like a principle axis confirmatory factor analysis to me (especially given the data rotation that you describe). In looking at these tables, two things come to mind. First, why have you run three separate analyses (one with the TLB, one with the phases, and a third with potency and safety)? It would be much more justifiable to run all of the items in a single factor analysis. Second, in your correlations table it appears that you have several significant relationships (especially between phase 1 & 2, phase 3 & 4, psychological safety and TLB. This must be discussed.

Finally, you must provide a rationale for using Varimax rotation in your factor analysis (Note: this can be problematic when it is known that factors are correlated, as indicated in your correlation matrix).

*We used an exploratory factor analysis with maximum likelihood, which is not a confirmatory factor analysis. Therefore, it tries to load a smaller number of variables highly onto each factor resulting in more interpretable clusters of factors (Field, 2009). We performed three separate EFA's on the individual level data: one EFA per sub-part of the TLB&B model. As such, one EFA was performed on the variables measuring psychological safety and group potency (1); one EFA was performed on the team learning section of the model (2) and one EFA was performed on the variables measuring the different phases of development (3). This analysis was inspired by research testing the team learning model of Van den Bossche, et al. (2006): they also investigated using three separate EFA's. After modifications to the model, which are all reported in the manuscript, the exploratory factor models fitted the data very well (as appears from the reported fit indices in the manuscript). We opted for the varimax rotation because it is a good general approach that gives simplified interpretations of factors. It tries to maximize the dispersion of loadings within factors.*

**Table 1.** Average response rates within teams.

Response rate	Frequency	Percentage	Cumulative percentage
20%	6	13.6	13.6
25%	4	9.1	22.7
27%	1	2.3	25.0
33%	3	6.8	31.8
40%	1	2.3	34.1
43%	1	2.3	36.4
50%	3	6.8	43.2
57%	1	2.3	45.5
67%	5	11.4	56.8
71%	2	4.5	61.4
75%	1	2.3	63.6
80%	3	6.8	70.5
82%	1	2.3	72.7
83%	2	4.5	77.3
86%	2	4.5	81.8
100%	8	18.2	100
Total	44	100	

**Table 2.** Descriptive statistics.

	N	M	SD	Variance
Phase 1 & 2	44	3.00	.74	.54
Phase 3 & 4	44	5.45	.64	.41
Group potency	43	5.28	.64	.41
Psychological safety	44	5.50	.89	.79
Team learning behaviours	44	5.58	.62	.39

**Table 3.** Correlations.

	Phase 3 & 4	Group potency	Psychological safety	TLB
Phase 1 & 2	-.70**	-.32*	-.70**	-.59**
Phase 3 & 4		.59**	.81**	.81**
Group potency			.50**	.68**
Psychological safety				.78**

Note: \* $p < .05$ , \*\* $p < .01$

**Table 4.** Clusters: Mean scores and standard deviations.

	Cluster 1		Cluster 2		Total	
	M	SD	M	SD	M	SD
Phase 1 & 2	3.75	.36	2.48	.40	3.00	.74
Phase 3 & 4	4.89	.45	5.84	.42	5.45	.64

**Table 5.** Results ANOVA analyses.

	Df	F	Sig.	$\eta^2$
Team learning behaviours	1,42	23.16	.000	.36
Psychological safety	1, 42	66.70	.000	.61
Group potency	1, 41	6.34	.000	.13

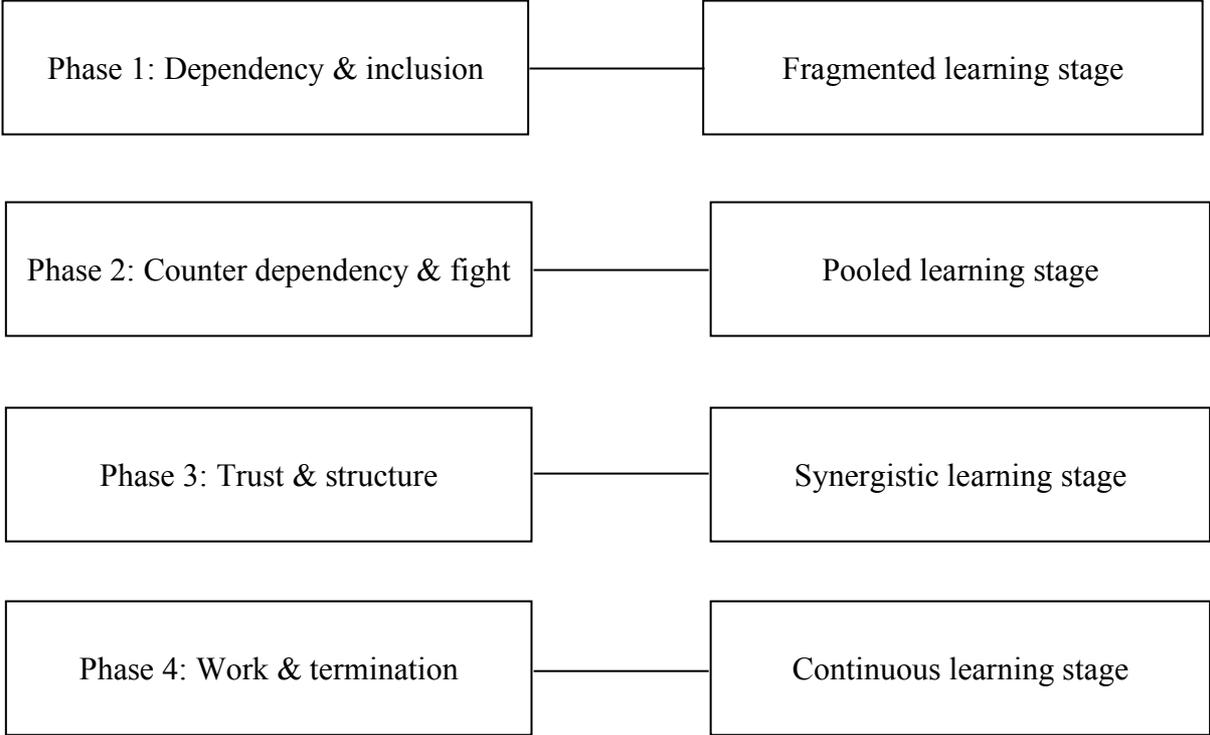
Note: Dependent variable: Team learning behaviours

**Table 6.** Results ANCOVA analyses.

	Type III sum of squares	Df	Mean square	F	Sig.	$\eta^2$
Intercept	.32	1, 39.35	.318	3.16	.083	.07
Group potency	1.67	1, 39	.102	16.37	.000	.30
Psychological safety	2.54	1, 39	.102	24.91	.000	.39
Clusters	.03	1, 39	.102	.25	.623	.01

Note: Dependent variable: Team learning behaviours

**Figure 1.** Team learning and group development



**Wheelan (2005)**

**Dechant et al. (1993)**

**Appendix 1: Items and factor loadings***Team learning behaviours*

Items	Factor loading
Team members draw conclusions from the ideas that are discussed in the team.	.837
Team members elaborate on each other's information and ideas.	.810
Comments on ideas are acted upon.	.805
Team members listen actively to each other	.792
If something is not clear, we ask each other questions	.782
Information from team members is complemented with information from other team members.	.781
This team tends to handle differences of opinions by addressing them directly.	.634
In this team I share all the relevant information and ideas I have.	.555
Opinions and ideas of team members are verified by asking each other critical questions	.434

*Development phases*

Items	Factor loadings	
	1	2
Phase 4: This team acts on its decisions.	.737	
Phase 4: This team encourages high performance and quality work.	.727	
Phase 3: We can rely on each other. We work as a team.	.668	-.410
Phase 4: This team spends time planning how it will solve problems and make decisions.	.658	
Phase 3: This team is spending its time planning how it will get its work done.	.639	
Phase 4: Team members want to work within this team again in the future.	.628	-.339
Phase 3: This team is able to form subgroups, or subcommittees, to work on specific tasks.	.586	
Phase 4: This team has effective conflict-management strategies.	.536	

Phase 3: Roles are becoming clearer in this team.	.485	
Phase 3: The content of our communication is task oriented.	.479	
Phase 4: This team completes tasks in a way all members agree upon.	.470	
Phase 2: Team members seem to have very different views about how things should be done in this group.		.760
Phase 2: Disagreement about goals and tasks emerge in this team.		.733
Phase 2: There is quite a bit of tension in the team at this time.		.709
Phase 1: There is a lack of group structure and organization in this team.		.583
Phase 1: Team members are concerned with personal acceptance of the team.		.442
Phase 1: We haven't discussed our goals very much in this team.		.432
Phase 2: Team members challenge the leader's ideas.		.362
Phase 1: There is very little conflict expressed in this team.		-.357

Rotated factor matrix: Varimax rotation  
Loadings below .35 omitted.

Excluded item: Team members tend to go along with whatever the leader suggests.

*Group potency and psychological safety*

Items	Loadings	
	1	2
This team believes it can become exceptionally good and successfully accomplishing each assignment.	.856	
This team believes it can be very effective.	.733	
This team expects to be known as a highly performing group.	.647	
This team believes that no assignment is too tough.	.642	
This team can get a lot done when it works hard.	.611	
If you make a mistake in this team, it is often held against you. ®		-.730
Members of this team are able to discuss problems and tough issues.		.674
It is difficult to ask other members of this team for help. ®		.656
People in this team sometimes reject other team members for being different. ®		-.641

It is safe to take a risk on this team.		.474
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Rotated factor matrix: Varimax rotation

Loadings below .35 omitted.

® Reversed item

Excluded items:

- This team has confidence in its own capacities.
- Working with members of this team, my unique skills and talents are valued and utilised.
- No one in this team would deliberately act in a way that undermines my efforts.