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**Antecedents and Consequences of Collective Psychological Ownership: The  
Validation of a Conceptual Model**

Abstract

We investigate team member feelings of collective psychological ownership (CPO) over teamwork products, the psychological paths that lead to it, and its impact on team workers' evaluations of team effectiveness, turnover intentions, and intentions to champion teamwork products. We focus on the teamwork product as an important target of ownership feelings, building on theories of self-extension, psychological ownership and team emergent states. In Study 1, we validate measures for three ownership activating experiences (OAE) that have been proposed as paths to CPO (control over, intimate knowledge regarding, and investment in the teamwork product) using two samples of individual team workers ( $n = 210$  and  $n = 140$ ). In Study 2 ( $n = 183$ ) and Study 3 ( $n = 200$ ), we use surveys and a multiwave design to show that team workers' feelings of CPO mediate the relationship between investment in and intimate knowledge regarding the product and team effectiveness evaluations, team turnover intentions, and intentions to champion the work product. In Study 4 ( $n = 48$  teams), CPO was predicted by the OAEs, at the team level. This research additionally highlights the benefits to organizations of creating conditions for the emergence of employee feelings of shared ownership over teamwork products.

*Keywords:* collective psychological ownership, ownership activating experiences, teamwork, scale development, team emergent state

## Introduction

Business media have long espoused the importance of feelings of ownership toward work projects (e.g., Bullock, 2014) to strengthen employee motivation. Yet only in the last 20 years has research rigorously examined employee feelings of ownership (without formal assertion of legal ownership) toward organizational objects, which is termed psychological ownership (PO; Pierce, Kostova, & Dirks, 2001). PO addresses the latent needs that individuals have to influence and to identify with people, groups, and objects in their environment (Pierce, Kostova, & Dirks, 2003). Teamwork is a fertile context in which to fulfill these needs because of the way it connects people with each other and with different tangible (e.g., written report; product design) and intangible (e.g., idea for a process improvement) products of work. When people create something with others, they can experience the output of their work as an extension of the group, as “ours.” A better understanding of how collective psychological ownership (CPO) develops in teams can provide ways for managers to enhance team members’ feelings of CPO toward important work products, thereby helping employees maintain high effort and commitment to team objectives (Dirks, Cummings, & Pierce, 1996).

Research on CPO has tended to focus on employee feelings of ownership toward jobs and organizations (e.g., Tseng & Uen, 2013; Brown, Pierce, & Crossley, 2014). However, as pointed out by Pierce, Kostova and Dirks (2003), the “most obvious and perhaps the most powerful means by which an individual invests him/herself into an object is to create it” (p. 17). In uncertain environments, for instance, and in teams experiencing frequent changes in membership, feelings of collective ownership over work products can provide individual employees with a sense of continuity and connection to the team and to their work. Therefore, in the current paper, we investigate employee feelings of shared ownership toward specific

teamwork products.

Although the mechanisms for CPO to emerge as a shared state within teams have been conceptually elaborated, how this emergence occurs over time has not been empirically explored. We examine CPO as a team emergent state using theories of social identity and self-extension. Specifically, as antecedents, we examine the three Ownership Activating Experiences (OAEs) proposed by Pierce and Jussila (2010)—control, intimate knowledge, and investing oneself into the work product—by developing and testing a scale for the OAEs and testing its effects on CPO and on team worker team effectiveness evaluations and behavioral intentions.

In Study 1, we validate the measures for each of the proposed OAEs and test the factor structure in two different samples. In Study 2, we assess the impact of the OAEs (at T1) on feelings of CPO (at T2). In Study 3, by using a three-wave design, we test the mediating role of CPO between the OAEs and team workers' evaluations of team effectiveness, team turnover intentions, and intentions to champion the work product. In Study 4, we use a referent-shift consensus composition model (Chan, 1998) to study CPO as a team “shared sense”. In this final study, we investigate the effects of the OAEs on CPO as an emergent state in a sample of 48 teams competing in a multiwave simulation. Thus, we answer to calls for more detailed theory regarding specific team emergent states (Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013; Mathieu & Luciano, 2019) and for research integrating PO into the organizational behavior field (Dawkins, Tian, Newman, & Martin, 2017) by investigating CPO toward the teamwork product, relating CPO to team theories, and empirically investigating CPO at the collective level.

## **Theoretical Framework and Hypotheses**

### **Psychological Ownership within Individuals and Groups**

Psychology, anthropology, and political philosophy authors have long referred to the products of work as a natural source of personal ownership. By interacting with and reflecting on possessions, “our sense of identity, our self-definitions, are established, maintained, reproduced and transformed” (Dittmar, 1992, p. 86). James (1890) characterized the work of our hands as something that we feel as “ours” and that may be “as dear to us as our own bodies.” Locke (1690) stated that the creator of a material object or an abstract thought incorporates a connection to that object of creation into his or her identity. Pierce, Kostova and Dirks (2001) introduced the term PO as feelings of personal ownership toward organizational targets (e.g., jobs, organization, projects) without the formal assertion of ownership. PO is a feeling that emerges within individuals when they recognize the target as part of their extended selves (Belk, 1988; Pierce Kostova & Dirks, 2001). Whereas individual psychological ownership (IPO) refers to feelings of “mine,” CPO specifically refers to feelings of “ours” and hence always has a collective agent (i.e., This is ours [versus mine]; This belongs to the group [versus to me]). Therefore, in addition to feelings of ownership, “a social-identity motive underpins the development of collective psychological ownership” (Pierce & Jussila, 2010, p. 815).

### **The Emergence of CPO over Teamwork Products**

CPO is a “shared sense of ours” that emerges within teams as a result of the interactions among team members in relation to the target of ownership (Pierce & Jussila, 2010), “a single and shared mind-set as it pertains to a sense of ownership for some object that is material (e.g., workspace, tools) or immaterial (e.g., ideas) in character” (Pierce & Jussila, 2010, p. 811). CPO is an example of an emergent state, which can be defined as a property of the team that develops over the life of the team and impacts team outcomes (Marks, Mathieu & Zaccaro, 2001).

Emergent states can be cognitive in nature (e.g., team mental models), affective (e.g., team cohesion), motivational (e.g., team potency), or mixed; indeed, they emerge through bottom-up processes and are amplified by interactions within teams and are manifested as higher level, collective phenomena, such as the attitudes, values, motivations, and cognitions of group members. Team emergent states capture the alignment (or misalignment) of team coordination efforts and task demands that are key to team viability (Kozlowski & Ilgen, 2006).

For CPO to emerge, individuals must recognize that others are also related to the work product within a team context, where members have a sense of interdependence and cohesion within the team (Henry, Arrow, & Carini, 1999). In teams working toward the common goal of creating a teamwork product, the interdependence between members to produce this product creates a sense of “us” within the team (Henry, Arrow, & Carini, 1999). The shared relationship that team members have with a teamwork product can be one way in which team members perceive the differences among themselves to be less than the differences between them and those not on the team, such that their self-concept is derived, in part, from belonging to the group (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). This sense of “us” held by individual team members creates a basis for the “self-extension” of the team to include work products within its collective identity as “ours.” Determining the boundaries of a team and the “*sharedness*” of a specific teamwork product (Pierce & Jussila, 2010) requires attention to person–object, other person–object, and person–person interactions. Thus, CPO requires the activation of a collective self, with each team member recognizing that not only is he or she psychologically tied to the work product, but also that others are too, prompting a referent shift from the self to the group, from “mine” to “ours” (Pierce, Jussila, & Li, 2017). This shows the importance of not only how members relate to *one another*, but also how members relate to *the work they do*, that is, the

specific tasks undertaken collectively and the work products they produce (McGrath, Arrow, & Berdahl, 2000).

Important to promoting one's own, others', and, finally, shared connections to a work product are experiences that demonstrate control over, intimate knowledge regarding, and investment into the shared work product (Pierce & Jussila, 2010), i.e., the ownership activating experiences (OAEs). The interdependency that must exist among team members to fulfill their roles and responsibilities (Hackman, 1983) is strengthened by team member control, intimate knowledge, and investment regarding the work product, which leads to the emergence of feelings of "ours" as a shared collective state in teams (Kozlowski et al., 2013).

**Control.** When exercised over a target, control is a key determinant of feelings of ownership (Furby, 1978). Control refers to using, shaping, and influencing a work product and controlling its use by others. According to Belk (1988), the self is experienced through a concrete set of persons, places, and things rather than simply through ideas of who we are. Because we connect to and value objects that we manipulate and use, those objects that we exercise control over are incorporated into and become part of the self (Prelinger, 1959), tapping into an intrinsic need for autonomy that is addressed by affecting our environment (Deci & Ryan, 2008). By controlling objects in their environment, individuals and groups can feel that they have efficacy and effectance (Pierce, Kostova & Dirks, 2001). Because ownership implies the ability to use and control the use of objects, exercising control over a work product for a period of time is likely to give rise to feelings of ownership. Thus, the objects that can be controlled become incorporated into the self, as we feel we own what we create, shape, or produce (Locke, 1690).

However, this collective sense of "us" within the team is likely to emerge gradually (Pierce, Kostova & Dirks, 2003) because individuals, on the one hand, use, influence, and shape

a shared product and, on the other hand, observe other team members using, influencing, and shaping the shared product. In this way, just as individuals define themselves in part through what they do (Wang, Law, Zhang, Li & Liang, 2019), they can identify an “us” based on what the group members *all* do in relation to a work product. Repeated use of and influence exercised over a work product connect a team member to the work product both psychologically and in the eyes of other team members. When individuals observe team members exercising control over a work product that they also exercise control over, it clearly shows who is in the group and that the individual is part of it (Ashforth, Harrison, & Corley, 2008). Therefore, when people perceive that they share power over the final outcome, the final decisions are perceived as “their decisions” (Agarwal & Ramaswami, 1993).

Exercising shared control over a teamwork product requires close coordination among members of the team. The more control that is exercised over a work product by the group members and that is observed by other group members, the more the individual members will connect with the group and extend the resulting collective self to that work product. The objects of cocreation become an extension of “we” insofar as they are used, changed, and defined by the decisions of the team members. Thus, CPO is more likely to emerge within groups where individuals have sufficient opportunities to use and control a work product and where they also have opportunities to observe and interact with other team members doing so. For example, if a team of programmers is developing a new app, to the extent that all have participated in deciding on the features included in that app, they will see themselves as collectively responsible for the object they create, begin to see themselves as “the cause” for that outcome, and feel collective ownership.

*H1a: The extent to which a team member feels that all team members control the*



*teamwork product is positively related to the degree to which a team member feels CPO toward the teamwork product.*

**Intimate knowledge.** In addition to defining their self-concept by what they are and what they do, individuals also define themselves in terms of what they *have*. This can include knowledge regarding a work product: the more information one has about a work product, the stronger an individual's connection will be to that object, and the more likely it will be included in the individual's self-concept (Rudmin & Berry, 1987). In addition, having knowledge of a product taps into our psychological need for relatedness and belonging (Deci & Ryan, 2008).

Experiences that lead people to feel part of a team include experiences through which they gain knowledge of a shared work product. For example, if only the members of a software programming team understand the way in which different blocks of code are connected to each other and what functionality these blocks provide, this will reinforce individuals' cognitive awareness of being a part of that team. In this way, in-group feelings emerge based on shared knowledge regarding the work product and that are contrasted with the lack of knowledge possessed by out-groups. Therefore, understanding the knowledge of other team members is important for evaluating both the fulfillment of formal roles and the relationship between team members and the collective product (McGrath, Arrow, & Berdahl, 2000).

When team members actively participate in the creation of a collective work product, they experience the interactions that lead to product creation and learn about the product itself. Developing intimate knowledge regarding the work product requires team members to coordinate cognitively with each other, integrate ideas, and create new knowledge (Cooke, 2015). These visible exchanges of knowledge regarding a collective work product with others

promote interdependence among team members, connect them to each other and to the team, and make visible the connections made by all in acquiring knowledge. Thus, feelings of ownership emerge from a “lived relationship” with the work product (Pierce, Kostova & Dirks, 2001), and it is this intimate knowledge of the target that makes it part of ourselves (Beaglehole, 1932, as cited in Pierce, Kostova & Dirks, 2003). The more the interaction by team members with the work product, the more profound the knowledge acquired will be, and the more intimate the connection will be developed in relation to the work product. The members of a team in which everyone is familiar with the details, the original purpose, and the history of the specific project are expected to experience higher levels of CPO toward the collectively created product.

*H1b: The extent to which a team member perceives that all team members intimately know the teamwork product is positively related to the degree to which a team member feel CPO toward the teamwork product.*

**Investment.** The physical, cognitive, and emotional investments made by individuals into objects connect these objects to the self (Csikszentmihalyi & Rochberg-Halton, 1981) and generate feelings of ownership toward the work output (Belk, 1988). According to Locke (1690), because we own our labor and ourselves, we feel that we own what we invest ourselves into. The time and energy—and even values and identity invested into the work product—“allows an individual to see their reflection in the target and feel their own effort in its existence” (Pierce, Kostova & Dirks, 2001, p. 17).

Within teams, the investments made by individuals and observed in other individuals can clarify the individuals’ sense of “us.” Seeing who has invested into a collective product is a

straightforward way to cognitively identify the boundaries of a team and to clarify one's own membership (McGrath, Arrow, & Berdahl, 2000). In addition, an individual's collective identity will more likely incorporate team membership if being part of the team is regarded as both important and positive. Greater investments by an individual and observed investments by other individuals are likely to increase the extent to which belonging to the team is regarded as positive, which is an important predictor of collective identification (Ashforth, Harrison, & Corley, 2008). As team members demonstrate their contribution to the team product by expending effort and proposing new ideas, team coordination is facilitated, and team members' connections to the collective task are clarified and strengthened (Mumford, Van Iddekinge, Morgeson, & Campion, 2008).

Individuals are more likely to acknowledge collective ownership of a product when other team members have significantly contributed to its creation. A sense of co-ownership with regards to the output of teamwork is more likely to emerge when individuals on a team perceive the situation as equitable, as a result of all members contributing energy, time, and effort, to justify the co-ownership that they are recognized as being entitled to (Adams, 1965). Sharing the PO of a shared work product is thus a socioemotional reward that can substitute for material rewards, or "roses" in lieu of "bread," as Martin and Harder (1994) termed it. Therefore, as in the example of the programming team, when team members perceive that all members have invested time and energy into creating the app, that product is more likely to be regarded as "ours."

*H1c: The extent to which a team member feels that all team members have invested in the teamwork product is positively related to the degree to which a team member feels CPO toward the teamwork product.*

### **The Consequences of CPO**

CPO is an emergent state that can be both cognitive and affective in nature, resulting in shared “feelings, knowledge, and beliefs about the target of ownership, and individual and collective rights (e.g., use, control) and responsibilities (e.g., protection of) in relation to that target” (Pierce & Jussila, 2010, p. 812). Cognitively, by activating the sense of “us” CPO may promote the alignment between the formal distribution of tasks and the contribution of team members. As a result of feelings of interpersonal attraction and team cohesion, CPO can also reinforce team members’ affective connection to the team and to the team product. Thus, CPO can have an important impact on team members’ attitudes and intentions toward both the teamwork product and the team itself. Accordingly, we propose specific effects of CPO attitudes and intentions toward the team (effectiveness evaluations and team turnover intentions) and toward the collective work product (championing the teamwork product).

### **Relationship Between CPO and Team Effectiveness**

In effective teams, members feel connected to the other members and to the projects of the group, members coordinate their behaviors when pursuing collective projects, and members share tools, knowledge, and other resources (McGrath, Arrow, & Berdahl, 2000). The team’s tasks shape the attitudes and intentions of individual members toward the team and its outputs by being a source of goals, roles, and team-based exchanges (Kozlowski & Klein, 2000). The emergence of CPO can play an important role in creating a functional network of member–task–tool relations that improves team performance (McGrath, Arrow, & Berdahl, 2000), driving teams to create solutions to problems related to the work product. Below, we review the effects

of individual PO on performance, and then we explain how the emergence of CPO in teams can lead to additional benefits in terms of team performance, continuity, and extra role behaviors.

Personal PO has been related to positive work behaviors, including organizational citizenship behaviors (Vandewalle, Van Dyne, & Kostova, 1995), feelings of responsibility (Druskat & Kubzansky, 1995, as cited in Druskat & Pescosolido, 2002), and pride and identity in outcomes (Pierce, Kostova & Dirks, 2001; Wagner, Parker, & Christiansen, 2003). Employees invest more in the work products that they feel they own and that have become incorporated into the self, as means of advancing this part of their identity. Because the work object created becomes a symbolic expression of self-identity, work performance becomes an important means of strengthening and communicating that identity. Thus “owners” should seek to perform their tasks well and proactively engage in discretionary behaviors that enhance work outcomes.

Although CPO subsumes personal PO (Pierce & Jussila, 2010), feelings of collective ownership are expected to lead to additional performance benefits at the individual and team levels because of the social dynamics present within teams. When team workers feel CPO, the work product is considered “ours” and a part of “us” (Belk, 1988), so team members are motivated to not only work hard on behalf of the work product, but also to engage in behaviors that improve internal group functioning (Druskat & Pescosolido, 2002). That is, perceptions of shared ownership lead to a class of social intentions referred to by Bagozzi and Lee (2002) as “group-oriented we-intentions”: an individual’s personal commitment to do his or her part toward a group goal in the belief that others within the group also will. In doing so, individual employees will increase their high-quality interactions with others and their social prestige with others who feel similarly connected to the shared work product (Wang et al., 2019). Team members will also expect similar effort and behavior from other “co-owners” (Pierce & Jussila, 2010), creating social pressure to perform at a high level.

Feelings of collective ownership are expected to be accompanied by feelings of shared responsibility to invest time and energy toward the work product. In a group where team members have high CPO, the shared creation is incorporated within the group boundaries and serves as a means for the team to demonstrate to each other and to external audiences the fruits of their shared efforts, including through their discretionary behaviors. Indeed, CPO has been empirically related to individual psychological empowerment, feelings of responsibility, affective commitment, job satisfaction, and citizenship behaviors (Pierce, Jussila & Li, 2017), which can be expected to enhance team performance. Pierce, Jussila and Li (2017) also found that CPO is positively related to group-level outcomes, including psychological safety, group potency, and group learning, all of which can be viewed as proxies for team effectiveness and are negatively related to social loafing. As a result of believing that the ownership of a work product is collective, team members realize that their goals and values are congruent and will be more willing to participate actively in activities that manifest the shared “we-intention”: “we will all work hard to improve this product” (Bagozzi & Lee, 2002). Increased effort and cooperation resulting from the emergence of CPO is expected to lead to increased performance and consequently, also to higher evaluations of team effectiveness. Hence, we expect that:

*H2: CPO is positively related to team effectiveness evaluations.*

*H3: CPO mediates the relationship between a) control, b) intimate knowledge, and c) investment regarding a work product and team effectiveness evaluations.*

### **Relationship Between CPO and Turnover Intentions**

Feelings of ownership toward organizational objects have been negatively related to turnover intention (Avey, Avolio, Crossley, & Luthans, 2009) and to several key predictors of voluntary turnover, including job satisfaction, organizational commitment, and psychological

empowerment (Avey et al., 2009; Van Dyne & Pierce, 2004; Tseng & Uen, 2013). When a team member feels CPO, the teamwork product addresses the needs for relatedness and belonging by connecting the team member to the team (Deci & Ryan, 2008). In this context, objects that we have created serve as visible examples of our influence over the environment, provide self-continuity, and tell other people who we are and what we do (Wang et al., 2019). Hence, the process mechanisms that contributed to the emergence of CPO will have strengthened team members' sense of "us." Members will be more reluctant to leave the group because this would risk damaging the collective product that they regard as an extension of themselves and that warrants protection (Belk, 1988; James, 1890). In addition, feelings of ownership are generally seen as accompanied by corresponding responsibilities, such as the obligation to invest time and energy on behalf of the target, which would be abrogated by exiting the team (Pierce, Kostova & Dirks, 2003). In contrast, if feelings of CPO are low or absent, team members feel less responsible for the proper functioning of the team and for the collective work product, making it easier and less consequential to leave.

Collective control, intimate knowledge regarding, and investments into the work product act as behavioral cues of a collective "sense of us" and of connection to the teamwork product, creating a social context that influences team members. CPO feelings emerge as a manifestation of the team's collective identity narrative: "We are one, so this is *ours*" (Ashforth, Harrison, & Corley, 2008). Hence, leaving a team that shares ownership of a work product also entails cutting off the connection to a work product that has become part of one's extended self. The shared work product is the visible evidence of past decisions, investments, and knowledge acquisition that can be identity-threatening to lose. Therefore, maintaining a connection to the work product

protects, enhances, and provides continuity to the identity of team members, making it less desirable to give up membership in the group and co-ownership of the work product.

Just as employees cannot always act on their intentions to leave an organization, they may not be able to exit a team. As noted by Shore and Martin (1989), organizational turnover is much more difficult to predict than intentions to leave since numerous external factors can affect actual turnover behaviour. Similarly, team members with a desire to leave will not always do so, and might not even be able to. Nonetheless, employees that intend to leave but do not do so can still harm the team and its performance by in other ways withdrawing (i.e., loafing or absenteeism) from the team (e.g., Karau & Williams, 1993). By measuring team workers' turnover intentions, we aim to tap into the teams' viability, in terms of participants' willingness to stay in the team, a form of behavioural commitment. This intention is especially relevant for individuals who are assigned to teams and unable to select their teammates, an arrangement prevalent in organizations (Bayazit & Mannix, 2003).

*H4: CPO is negatively related to turnover intentions.*

*H5: CPO mediates the relationship between a) control, b) intimate knowledge, and c) investment regarding a work product and team turnover intentions.*

### **Relationship Between CPO and Championing the Teamwork Product**

Research on the ownership effect has demonstrated that people perceive the objects they own as more attractive and hence are more likely to defend and protect these objects (Beggan, 1992). Additionally, research on the "endowment effect" has shown that people evaluate an object more highly when it belongs to them (Kahneman, Knetsch, & Thaler, 1990). We hypothesize a similar affective reaction will occur in the presence of CPO feelings. PO has been



theorized as increasing the pride and identity invested in a target (Pierce, Kostova & Dirks, 2001; Wagner, Parker, & Christiansen, 2003) although this has not been empirically investigated at the individual or collective level. Because ownership is generally associated with the obligation to protect, care for, and make sacrifices for the target of ownership (Pierce, Kostova & Dirks, 2001), the emergence of CPO should engender a willingness in team members to actively promote something that has become incorporated into the group's collective identity (Pierce, Kostova & Dirks, 2003).

Individuals maintain a sense of self by engaging in stable patterns of behavior that bring personal meaning to their roles (Pierce, Kostova & Dirks, 2003). Within teams where members are closely connected to the group and to the collective products—and hence where CPO is experienced—team members will be motivated to engage in behaviors that promote and defend the teamwork product. For example, researchers have suggested that feelings of ownership should increase individuals' willingness to expand their responsibilities and increase their work efforts (Brown, Pierce, & Crossley, 2014) and to engage in proactive work behaviors (Wang et al., 2019). One way to do so is through championing the product, which is defined as putting extraordinary effort into an idea or product (Shane, 1994). Championing arises from the strong commitment of an individual or group to a product or idea rather than from formal roles vis-a-vis the product, and includes the promotion of the work product to stakeholders and potential sponsors outside of the team (e.g., Van de Ven, 1986). Because of their strong attachment to a team's creation, team members with high versus low levels of CPO are expected to more intensively champion the team product.

*H6: CPO is positively related to championing the teamwork product.*

*H7: CPO mediates the relationship between a) control, b) intimate knowledge, and c) investment regarding a work product and championing the teamwork product.*

### **A Shared Perception of CPO**

So far, we have proposed how at the individual level the OAEs act as process mechanisms that can lead to perceptions of CPO. Thus, we have focused on CPO and its activating experiences from the individual perspective with a collective referent —the extent to which individual team members feel that the collective work output belongs to all team members. As researchers have often done in other areas, we use constructs and collect data at a lower level as a starting point to explore a construct at a higher level (Chen & Kanfer, 2006; Costa, Passos, & Bakker, 2014). To further explore the bottom-up process whereby individual characteristics and dynamic social interactions result in a higher level property of CPO, we investigate how OAE perceptions, when aggregated to the team level, can influence collective CPO, measured as individual perceptions aggregated to the team level (Kozlowski & Klein, 2000).

Pierce and Jussila (2010, p. 810) proposed that “collective psychological ownership emerges through interactive dynamics whereby individuals come to a single and shared mind-set as it relates to a sense of ownership for a particular object.” The OAEs at the individual level are amplified by interactions within the team via members’ interdependent “habitual routines” (Gersick & Hackman, 1990) to form a collective perception regarding the control over, intimate knowledge regarding, and investment in the teamwork product. Thus, at the collective level, perceptions regarding the three OAEs are expected to converge among team members. These shared perceptions regarding the OAEs are then expected to lead to the emergence of feelings of CPO in the team regarding the teamwork product.

*H8: Teams' shared sense of control, knowledge, and investment over the teamwork product are positively related to a shared sense of CPO toward the teamwork product.*

### **Overview of the Studies**

In Studies 1a and 1b, we generated, refined, and validated the items for the three proposed OAEs. In Study 2, we investigated the relationships among the three proposed OAEs (T1) and team members' CPO (T2, 1 month later). In Study 3, we used a three-wave design to test the discriminant validity of CPO (in relation to the proximal constructs—team identification, affective commitment, and IPO) and the mediating hypotheses—that is, OAEs leading to team member evaluations of team effectiveness and to behavioral intentions through CPO. In these studies, the OAEs and CPO were measured at the individual level with a team referent (Study 1, 2, and 3), and the outcomes were measured at the individual level (Study 3). In Study 4, we explored the dimensionality at the team level of the OAEs and their impact on CPO by aggregating at the team level individual OAE and CPO scores. For an overview of all studies, see Table 1.

[Table 1 near here]

### **Study 1a: Creation of the OAE Measure**

**Item development.** Based on the theoretical framework presented, the items were developed following the steps for scale validation proposed by Hinkin (1998) and DeVellis (2003). We initially proposed 10 items for the three OAEs first proposed by Pierce, Kostova and Dirks (2001): control (e.g., “Together, we all had a lot of control over how the TEAMWORK OUTPUT was created”), knowledge (e.g., “All of us know this TEAMWORK OUTPUT very well”), and investment (e.g., “All of us spent a great deal of energy building the TEAMWORK

OUTPUT”). For a group of individuals to experience a referent shift from “I” to “us” and from “mine” to “ours,” the group must share experiences that are related to the target (Costa, Passos, & Bakker, 2014; Kozlowski et al., 2013). Therefore, consistent with Pierce, Jussila and Li (2017), in the current study, we use all the members of the team as a collective referent, that is, “We all...” / “All of us.” This sentence structure was designed to allow the measure to be easily adapted for different CPO targets, by simply replacing TEAMWORK OUTPUT (in capitals, to focus participants’ attention on the specific target they have selected) with another target of ownership feelings.

The 30 items were somewhat inclusive and redundant (e.g., “We all really understand the TEAMWORK OUTPUT” and “All of us know the TEAMWORK OUTPUT very well.”). It is better to initially be overinclusive because the content common to the items will be salient across the items while the less relevant characteristics will cancel out, and here, even extreme redundancy is acceptable as long as it is not included in the final scale (DeVellis, 2003).

**Item validation.** Next, the 30 items were presented in random order to 10 organizational behavior researchers who were asked to assign each item to one of four categories: control, knowledge, investment or “other.” Because item reliability can be affected by unclear wording that reflects extraneous factors (DeVellis, 2003), the expert reviewers were also asked to evaluate item clarity and conciseness and suggest clearer wording. The items retained in the scale were those that 80% or more of the experts assigned to the correct dimension (Hinkin, 1998). Of the 30 original items, 22 satisfied our criteria for capturing the proposed content domains.

### **Exploratory Factor Analysis**

**Procedures and sample.** The first sample consisted of 210 working adults with

teamwork experience and who came from a wide cross-section of organizations. The participants were contacted on MTurk<sup>1</sup> to participate in a short web-based survey, and they were selected to participate if 1) they were currently working on a team project, and 2) if that team had been working together on the teamwork output for at least 1 month. The mean age was 42.2 years (SD 13.4), mean work experience was 20.5 years (SD 13.0), 63.8% were female, and 97.1% of the participants were from the United States, with the remainder from the UK. Most of the participants were employed full time (95.7%), 2.9% were employed part time, and 1.4% were students. The participants were asked to describe in a short sentence the product that they had created or were in the process of creating as a team. If the team had created or was creating more than one work product, the participants were asked to identify a single work product to focus on. Before each set of questions, the participants were asked to keep in mind the specific team and teamwork output that they had described earlier, referred to throughout as “TEAMWORK OUTPUT.”

**Results.** We conducted an exploratory factor analysis (EFA) of the 22 items using several well-recognized criteria. First, for each factor, all the items were correlated at a minimum of .4 with at least one other item, suggesting reasonable factorability. Second, the Kaiser-Meyer-Olkin measure of sampling adequacy was .96, which exceeds the recommended value of .6, and Bartlett’s test of sphericity was significant ( $\chi^2 [231] = 3190.520, p < .05$ ). Given these overall indicators, a factor analysis was conducted with all 22 items using maximum likelihood extraction and Promax rotation. Three factors explained 64.2% of the variance. The following

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<sup>1</sup> We have addressed the limitations regarding the use of MTurk for data collection by including attention check items in our questionnaires. In Study 1, Study 2, and Study 3, in our final samples, we only included responses from participants who described a teamwork output and belonged to ongoing teams. Participants with descriptions that were unclear or with random entries of text were excluded.

criteria were used to determine whether an item loaded onto an underlying factor: (a) the item had a factor loading of .60 or better on one factor; (b) the item had a loading of less than .40 on the second factor; and (c) the cross-loading differential across the two factors was less than .25 (Costello & Osborne, 2005). In total, 18 items satisfied these criteria (see Table 2).

As shown in Table 2, the first factor consists of eight items that assess team member investment in the teamwork output; this factor is referred to as “investment.” The items in this factor include “All of us spent a great deal of energy to build the TEAMWORK OUTPUT.” The second factor consists of six items that assess team member knowledge of the teamwork output, and is referred to as intimate knowledge. The items in this factor include “All of us know this TEAMWORK OUTPUT very well.” The third factor consists of four items that assess team member control over the teamwork output, and is referred to as control. The items in this factor include “All of us had control over how this TEAMWORK OUTPUT developed.” To further reduce the length of the scale to four items per dimension, we excluded six items because of content redundancy (items 8, 14, and 15) and, in the case of investment, because they extended the meaning to the quality of the tea product, for example (items 1, 2, and 4). The final measure consists of four items for each subscale for a total of 12 items (see Table 3 for a complete list of the items).

[Tables 2 and 3 near here]

### **Study 1b: OAEs Measure Validation**

**Confirmatory factor analysis.** In Study 1b, we examined the validity of the revised scales using confirmatory factor analysis (CFA).

**Procedures and sample.** The sample for Study 1b consisted of 140 working adults with teamwork experience and who came from a wide cross-section of organizations. The participants

received an e-mail requesting their participation in a short web-based survey, and they were contacted and selected using the same procedure as in Study 1a. The mean age of the participants was 46.5 years (SD 11.6), their mean work experience was 23.5 years (SD 12.0), 58.6% were female, and 99.3% were from the United States. The remaining participants were from the UK. Most of the participants—95.7%—were employed full time, 2.9% were employed part time, and 0.7% were students.

**Results.** A CFA was performed on the second sample to cross-validate the three-factor solution from the EFA. Because the proposed three-factor structure exhibited a very good fit ( $\chi^2(51) = 87.428, p < 0.01$ ; RMSEA = 0.071; CFI = 0.97; TLI = 0.96; SRMR = 0.050), the items loading on their respective factors were combined to form the constructs. The investment scale was correlated with the control scale ( $r = .42, p < .001$ ) and intimate knowledge scale ( $r = .54, p < .001$ ). The control scale was correlated with the intimate knowledge scale ( $r = .57, p < .001$ ). The three four-item scales revealed moderate to very good internal consistency: Cronbach's alpha was .94 for investment ( $M = 4.2, SD = 0.7$ ), .76 for control ( $M = 4.0, SD = 0.6$ ), and .88 for intimate knowledge ( $M = 4.3, SD = .63$ ).

### **Study 2: Predictive Validity of OAEs**

Using the validated scales for the OAEs developed and tested in Study 1, Study 2 explores the relationship between the OAEs and CPO.

**Procedures and sample.** The sample for Study 2 consisted of 183 working adults with teamwork experience and who came from a wide cross-section of organizations. The target sample received an e-mail requesting participation in a short web-based survey via MTurk. The mean age for the sample was 46.9 years (SD 12.1), the participants had on average 23.9 years (SD 11.2) of work experience, 43% were female, and 98.3% were from the United States, with

the remainder from the UK. Most of the participants were employed full time (97.3%). Data were collected in two waves, separated by 1 month. At Time 1 (the first wave), the participants were asked to describe the output or product of a team to which they belonged. At Time 1 and Time 2, when answering the questions, the participants were reminded of that specific teamwork output, which was referred to by the name they had provided and was referred to in the items and instructions as “TEAMWORK OUTPUT.”

**Measures—Time 1.** *OAEs: Control, intimate knowledge, and investment.* The OAEs were measured using the previously validated measure (Studies 1a and 1b). Responses were on a 5-point Likert scale that ranged from 1 = strongly disagree to 5 = strongly agree. The participants were told, “While working together in developing a TEAMWORK OUTPUT, team members can invest themselves into the work with their time, energy, and effort/ team members can influence the decisions made/ team members can get to know the TEAMWORK OUTPUT very well. Recall the specific work output and that specific team experience you reported. Please answer to what extent you agree with the following statements.”

**Measures—Time 2.** *Collective psychological ownership.* CPO was measured using Pierce, Jussila and Li’s (2017) five-factor scale ranging from 1 = strongly disagree to 5 = strongly agree. The participants were asked to “think about the house, automobile, or some other item that you own or co-own with someone, and the experiences and feelings associated with the statement ‘this is ours!’ The following questions deal with the ‘sense of ownership’ that you and your work team members feel for (TEAMWORK OUTPUT). Indicate the degree to which you personally agree or disagree with each of the following.” The items for this factor included “We (my team members and I) have a collective sense that this (TEAMWORK OUTPUT) is ours.”

**Results.** The means, standard deviations, and correlations for all the variables are



presented in Table 4. Cronbach's alpha values for the constructs, which are provided in the diagonal, range from .63 to .92, with most exceeding the .70 cutoff suggested in the literature.

[Table 4 near here]

*Confirmatory factor model.* We used MPLUS 8.1 (Muthén & Muthén, 2017) to test the discriminant validity of our measures. The results of the CFA model indicate that the fit indices fall within an acceptable range ( $\chi^2 = 199.722$ ;  $p < .001$ ;  $df = 113$ ,  $RMSEA = .07$ ;  $CFI = .95$ ;  $TLI = .94$ ,  $SRMR = .06$ ; Hu & Bentler, 1999).

To check for potential common method bias, we followed Podsakoff, MacKenzie, Lee, and Podsakoff's (2003) guidelines and added an orthogonal latent common method factor to our hypothesized confirmatory factor model. This model yielded a good fit ( $\chi^2[96] = 126.60$ ,  $p = .02$ ,  $CFI = .99$ ,  $NNFI = .99$ ,  $RMSEA = .00$ ) and was significantly different from a model that did not include the method factor ( $\Delta\chi^2 [39] = 73.12$ ,  $p < .001$ ). However, the factor loadings of all our measures of interest were medium to high ( $\lambda$ s range from .43 to 1.00,  $mean = .72$ ) and remained significant (t-values range from 3.84 to 14.00) despite the addition of this unmeasured method factors. These findings further confirmed the psychometric adequacy of our measures (Bagozzi, 2011).

*Structural equation model.* We used MPLUS 8.1 (Muthén & Muthén, 2017) to test the relationships between the OAEs (control, intimate knowledge, and investment) and CPO. The results of our model reveal that the fit indices fall within an acceptable range ( $\chi^2 = 148.190$ ;  $p < .01$ ;  $df = 113$ ,  $RMSEA = .04$ ;  $CFI = .98$ ;  $TLI = .98$ ,  $SRMR = .06$ ). The regression analysis shows that investment ( $\beta = .19$ ,  $p < .01$ ) and knowledge ( $\beta = .29$ ,  $p < .01$ ) are related to CPO, whereas control is not ( $\beta = .05$ ,  $ns$ ). Thus, H1b and H1c are supported, whereas H1a is not.

### **Study 3: CPO Antecedents and Consequences**

Building on Study 2, which found positive relationships between two OAEs (investment and intimate knowledge) and CPO, Study 3 relates the OAEs and CPO to important team worker perceptions and intentions while distinguishing CPO from IPO and from team member attitudes toward the team, such as team identification and affective commitment.

**Procedures and sample.** The antecedents, mediators, and consequences were measured in three different waves. We used the TurkPrime platform to obtain team members (a) working in real teams; (b) working on a project for at least 1 month prior to the screening; and (c) working on a project that would last at least 3–6 months (the duration of our study). We contacted 5,048 workers and administered a screening questionnaire to determine whether a specific teamwork output was being created and to gather information regarding professional status, teamwork experience, team size, team interdependence, and teamwork project duration. The participants in teams with more than 10 members or less than three members were excluded. We asked the participants to name and describe what they were creating in their teams and included only the participants who described a specific tangible product, such as a budget template, or an intangible product, such as a resourcing process, that was being collectively created by an interdependent team.

Data were collected through a screening survey and, in waves, three subsequent waves to test the mediation model. Dormann and Van de Ven (2014) state that the variables measured and their operationalization should inform how long the lags between waves should be. The screening survey was conducted at T0, and the three data collections were conducted at T0 plus one month (T1), T0 plus three months (T2), and T0 plus 4 months (T3). Because participants had been working together long enough, i.e., at least one month, to reflect on levels of control,

intimate knowledge, and investment in the teamwork product, each of which is a precursor to CPO, OAE were measured in T1. CPO itself and measures for discriminant validity were measured in T2, after which participants had experienced at least three months of teamwork related to a specific product. Workplace outcomes were measured in T3, including team effectiveness, intentions of leaving the team, and championing of the teamwork output. In each wave, prior to answering questions, participants were reminded of the teamwork output they had initially described in the screening survey.

Following the screening process, 627 workers were invited to participate in our three-wave study. At T1, 322 participants responded to the survey, followed by 254 at T2 and 200 at T3. Hence, the final sample for the study was 200 working adults with teamwork experience and who came from a wide cross-section of professional backgrounds. The mean age for the sample was 35.2 years (SD 10.3), the mean work experience was 14.6 years (SD 10.0), and 44% were female.

**Measures.** Unless otherwise indicated, all Study 3 scales were measured using a 5-point Likert-type scale that ranged from 1 = strongly disagree to 5 = strongly agree.

**Predictors (Time 1) and mediators (Time 2).** *OAEs* and *CPO* were measured in the same way as in Study 2.

**Outcomes (Time 3).** *Team effectiveness evaluations* were assessed using four items created for the current research to measure specific aspects of team effectiveness, such as meeting deadlines and avoiding technical problems. The items included “To what extent did the team respect deadlines?” The participants evaluated each on a 5-point scale that ranged from 1 = not at all to 5 = very much so. The participants could indicate “not applicable” if they felt a specific aspect of team effectiveness did not apply to their team context.

Team *turnover intentions* were measured using three of the five items from Rusbult, Farrell, Rogers, and Mainous (1988) adapted to a team context. The items included, “I seriously consider quitting this team.”

*Championing the teamwork output* was assessed using five items created for the current study. The items included, “I am willing to represent the TEAMWORK OUTPUT outside my team.”

#### *Discriminant validity*

*Team identification* was assessed using four items from Mael and Ashforth’s (1992) six-item scale, adapted to a team context. The items included “When someone criticizes this team, it feels like a personal insult.”

*Affective commitment* was measured using four items from Meyer, Allen, and Gellatly’s (1990) affective commitment scale, adapted to a team context. The items included, “I really feel as if the team's problems were my own.”

*IPO* was measured using four items from Van Dyne and Pierce’s (2004) seven-item scale adapted to a team context. The items included, “I have a sense that the TEAMWORK OUTPUT is mine.”

**Results.** First, we report the measurement model and discriminant validity analyses. Second, we test the hypotheses using structural equation modeling and mediation analyses. The correlations, means, and standard deviations for all the variables are presented in Table 5. Cronbach’s alpha values are provided in the diagonal and ranged from .72 to .93.

[Table 5 near here]

*Discriminant validity.* First, to study the discriminant validity of CPO, we conducted a series of CFAs for the three OAEs, CPO, team identification, affective commitment, and IPO.

We first conducted a CFA to assess the fit of our hypothesized seven-factor model. The items were specified to load on their respective scales. The results in Table 6 indicate that the seven-factor model provided an overall good fit to the data, clearly demonstrating discriminant validity in terms of CPO being distinct from team commitment, identification, and IPO. Specifically,  $\chi^2/df = (813,098/443) = 1.84$ , which is close to 2, thus indicating a good fit; the CFI and TLI are, respectively, .91 and .90, which also indicates an acceptable fit; and the RMSEA and SRMR values of .064 and .061, respectively, are below the .08 cutoff suggested by Hu and Bentler (1999). Thus, in following Schreiber, Nora, Stage, Barlow, and King (2006)—who stated that the  $\chi^2$ , RMSEA, and SRMR indices are most important when evaluating model fit and advocated for an overall approach for a fit evaluation that is less strict regarding the CFI and TLI cutoff points—we evaluate the seven-factor model as having an overall good fit.

The seven-factor model was compared with five alternative models (see Table 6): a six-factor model that combines CPO with IPO (model 4), a six-factor model that combines CPO with affective commitment (model 5), and a six-factor model that combines CPO and identification (model 6). Additionally, we compared the seven-factor model with a three-factor model that combines all the psychological-ownership-related constructs (model 2) and with a four-factor model that collapses all IPO and CPO items into a single factor and all OAEs items together into another factor (model 3). Finally, we tested a one-factor model (model 1). All  $\chi^2$  difference tests showed that the seven-factor model fit significantly better than all the alternative models ( $p < .001$ ).

[Table 6 near here]

*Structural equation model.* As recommended by Anderson and Gerbing (1988), prior to testing our hypotheses, we examined the fit of the CFA to test the adequacy of the measurement

model. The fit indices of the proposed model were acceptable:  $\chi^2 = 770.081$ ,  $p < .01$ ,  $df = 114$ ,  $CFI = 0.92$ ,  $TLI = 0.90$ ,  $RMSEA = 0.07$ , and  $SRMR = 0.06$ .

Structural equation modeling using MPLUS 8.1 (Muthén & Muthén, 2017) was used to test our hypotheses. The fit indices of the proposed model were acceptable:  $\chi^2 = 625.053$ ,  $p < .01$ ,  $df = 329$ ,  $CFI = 0.93$ ,  $TLI = 0.91$ ,  $RMSEA = 0.07$ ,  $SRMR = 0.06$ . Table 7 presents the SEM results.

[Table 7 near here]

As indicated in Table 7, intimate knowledge ( $\beta = .26$ ,  $p < .05$ ) and investment ( $\beta = .28$ ,  $p < .05$ ) were related to CPO, whereas control was not ( $\beta = .17$ ,  $ns$ ). Thus, Hypothesis 1b and Hypothesis 1c were supported, and H1a was not.

As predicted by Hypothesis 2, CPO related to team effectiveness evaluations ( $\beta = .34$ ,  $p < .001$ ). Hypothesis 3 proposed that CPO mediates the relationship between control (H3a), intimate knowledge (H3b), and investment (H3c) and team effectiveness evaluations. Hypothesis 3a was not supported because the indirect effects of control on the outcome variables were not significant. The indirect effect between intimate knowledge and team effectiveness evaluations, however, was mediated by CPO ( $\beta = .09$ , 95% CI .04, .18), thus providing support for Hypothesis 3b. The indirect effect between investment and team effectiveness evaluations was also mediated by CPO ( $\beta = .09$ , 95% CI .04, .19), thus providing support for Hypothesis 3c.

As predicted by Hypothesis 4, CPO related negatively to team turnover intentions ( $\beta = -.37$ ,  $p < .01$ ). Hypothesis 5 proposed that CPO would mediate the relationship between control (H5a), intimate knowledge (H5b), and investment (H5c) and team turnover intentions. Hypothesis 5a was not supported because the indirect effect of control on the outcome variable was not significant. Furthermore, the indirect effect between intimate knowledge and turnover

intentions was also significant ( $\beta = -.10$ , 95% CI  $-.22, -.03$ ),<sup>2</sup> providing support for H5b. H5c was supported because the indirect effect between investment and team turnover intentions was mediated by CPO ( $\beta = -.10$ , 95% CI  $-.22, -.04$ ).

As predicted by Hypothesis 6, CPO was related to championing intentions ( $\beta = .40$ ,  $p < .001$ ). Hypothesis 7 proposed that CPO would mediate the relationship between control (Hypothesis 7a), intimate knowledge (Hypothesis 7b), and investment (Hypothesis 7c) and championing intentions. Hypothesis 7a was not supported because the indirect effect of control on the outcome variable was not significant. However, the indirect effect of intimate knowledge on championing the teamwork output was significant ( $\beta = .11$ , 95% CI  $.04, .22$ ). Hence, Hypothesis 8b was supported. Furthermore, the indirect effect of investment on championing was mediated by CPO ( $\beta = .11$ , 95% CI  $.05, .23$ ), thus providing support for Hypothesis 8c.

#### **Study 4: Predictive Validity of OAEs at the Team Level**

Whereas in our first three studies, CPO was measured at the individual level (e.g., team member individual perspective on “We (my team members and I) have a collective sense that this (TEAMWORK OUTPUT) is ours.”), in Study 4 we investigate CPO as an emergent state in order to explore the interrelationship between the OAEs and CPO at the team level.

**Procedures and sample.** Data were collected from the participants of the Global Management Challenge (GMC; [www.worldgmc.com](http://www.worldgmc.com)). In the challenge, teams ran a fictitious company and competed to attain the highest share price on a simulated stock exchange. The simulation took place over 5 weeks, with each week representing one fiscal quarter. Teams made

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<sup>2</sup> The p-value and confidence interval (CI) for the results presented in Table 7 appear to be in conflict. In these cases, the CI is more informative because it takes into account possible nonsymmetry in the sampling distribution of the estimate (American Statistical Association, 2006).

weekly decisions about production, purchasing, personnel, marketing, and finance. Following each decision point, the share price and competitive ranking for each team were calculated, and a financial performance report was sent to each team. The OAEs were measured in Week 3 when the teams had already proposed and received feedback on three decisions. Thus, at this point, the team members had sufficient experience to evaluate collective investment in, knowledge of, and control over the team decisions and were likely to have formed a sense of “ours.” CPO was measured in Week 5. The 48 participating teams (203 individuals) consisted of company managers (59.6%), university students (35.5%), or both (4.9%). Teams had three to five members, the average team size was 4.4 persons ( $SD = .79$ ), average participant age was 32.8 years ( $SD = 10.3$ ), and 65% were male.

**Measures—Time 1 (week 3 of the GMC).** *OAEs: Control, intimate knowledge and investment.* The OAEs were measured with an abbreviated version of the previously validated measure (Studies 1a and 1b), here using three items for each subscale. For this data collection, the wording,<sup>3</sup> “TEAMWORK OUTPUT” was replaced by the specific work product of these teams during the GMC, that is, “DECISION.” The responses were on a 7-point Likert scale from 1 = strongly disagree to 7 = strongly agree. Cronbach’s alpha was .98 for investment, .88 for control, and .95 for intimate knowledge.

**Measures—Time 2 (fifth and final week of the GMC).** *Collective psychological ownership.* CPO was measured using Pierce, Jussila and Li’s (2017) five-item scale, with responses on a 7-point Likert scale from 1 = strongly disagree to 7 = strongly agree. Cronbach’s alpha for the CPO scale was .99 ( $M = 6.24$ ,  $SD = 0.98$ ). The items included “We (my team

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<sup>3</sup> All items in the current study were translated and backtranslated from English to Portuguese by a bilingual OB researcher who was independent of the research team.



members and I) have a collective sense that this decision is ours”.

**Results.** We used MPLUS 8.1 (Muthén & Muthén, 2017) to test the discriminant validity of our measures. Team scores were calculated by aggregating individual item scores per team. Considering the number of free parameters in the model and the observations available, we used the partial disaggregation of the items approach recommended by Bagozzi and Heatherton (1994); this approach enables each dimension to be measured with two indicators, wherein each indicator is itself the average of multiple items. Following this approach, each OAE dimension was measured using two items computed as the average of, respectively, the odd items and the even items. Similarly, the CPO construct was measured by two items computed as the average of, respectively, the odd items and even items. Table 8 summarizes the mean scores, standard deviations, correlations, and within-group interrater agreement ( $rwg(j)s$ ) for all variables in the current study.

Because the unit of the present analysis is the team, the scores for all the measures were calculated using the mean of the team members' responses and were aggregated to the team level for statistical analysis. The variables presented acceptable average values of within-group interrater agreement ( $rwg(j)$ ; James, Demaree, & Wolf, 1993), based on a cutoff point of .70 (Cohen, Doveth, & Eick, 2001).

[Table 8 near here]

Considering the effects of multicollinearity because of the high correlation between the OAE dimensions at the aggregated level, the variables that compose the OAEs (control, knowledge, and investment) were modeled as a second-order factor model. The second-order CFA indicates superior fit indices ( $\chi^2 = 36.305$ ;  $p < .001$ ;  $df = 16$ ,  $RMSEA = .163$ ;  $CFI = .950$ ;  $TLI = .912$ ,  $SRMR = .086$ ; Hu & Bentler, 1999) compared with the model with OAEs as the

first-order variables ( $\chi^2 = 76.140$ ;  $p < .001$ ;  $df = 19$ ,  $RMSEA = .250$ ;  $CFI = .859$ ;  $TLI = .792$ ,  $SRMR = .143$ ), presenting a significant chi square difference of 39,835 ( $p < .001$ ). Additionally, control ( $\beta = .69$ ,  $p < .005$ ), knowledge ( $\beta = 1.06$ ,  $p < .001$ ) and investment ( $\beta = .86$ ,  $p < .001$ ) significantly relate to the second-order OAE construct that includes all three dimensions.

*Structural equation model.* We used MPLUS 8.1 (Muthén & Muthén, 2017) to test H8, which proposed that CPO would be predicted by control, intimate knowledge, and investment. The SEM model presented acceptable fit indices ( $\chi^2 = 36.305$ ;  $p < .001$ ;  $df = 16$ ,  $RMSEA = .163$ ;  $CFI = .950$ ;  $TLI = .912$ ,  $SRMR = .086$ ) (Hu & Bentler, 1999). The SEM analysis shows that the OAE second-order factor has an impact on CPO ( $\beta = .47$ ,  $p < .001$ ). The results of Study 4 indicate that at the group level, the aggregated OAEs lead to CPO.

## Discussion

In the current research, we investigated CPO in terms of both activating experiences and consequences. In Study 1, we developed and validated measures for the three OAEs that have been proposed as avenues for the emergence of CPO. In Studies 2, 3, and 4, we tested the relationship between these OAEs and CPO and examined the mediating role of CPO in the relationship between the OAEs and team turnover intentions, team effectiveness evaluations, and intentions to champion the shared work product. Consistent with psychological ownership theory (e.g., Pierce, Kostova & Dirks, 2001), all three proposed OAEs related to CPO (see Tables 4 and 5). That is, individual perceptions of shared experiences of control, intimate knowledge, and investment in a teamwork product predicted CPO, as proposed by Pierce and Jussila (2010). However, when all three antecedents were simultaneously considered, only the relationships between investment and CPO and between intimate knowledge and CPO remained significant.

Our results show that CPO is distinct from feelings toward the team, such as team identification, commitment and also from IPO (see Table 6). CPO, when measured from an individual perspective, predicted several important team workers' perceptions and intentions. Team members who felt CPO toward the teamwork product perceived their team as being effective and wanted to remain on the team. In addition, team member feelings of CPO predicted intentions to champion the teamwork product, a behavior specifically related to the work output rather than to the team itself. CPO mediated the relationships between investment and turnover intentions, championing intentions, and perceived team effectiveness. CPO also mediated the relationship between intimate knowledge and both championing intentions and perceived team effectiveness. Thus, most mediation hypotheses were supported.

In Study 4, individual perceptions for each OAE item were aggregated at the team level to provide a collective score for each item. The items for the three OAEs were then combined into a single second-order factor because of the high correlations between the three OAEs at the collective level (e.g., a .93 correlation between knowledge and investment). The high correlations may have resulted from a process, as has been found for other affective-motivational constructs (Costa, Passos & Bakker, 2014), whereby moving from an individual internal state—based on observable cues—to the awareness of a shared state may result in more general perceptions of how a group is functioning. This holistic perception of the OAEs, when combined into a single factor, predicted CPO.

It is important to note how CPO was measured in our studies. Because we aimed to study the origin of CPO and to identify the process mechanisms that form CPO, in Study 1, Study 2, and Study 3, we measured CPO from an individual perspective with a collective referent. That is, individual team members reported their perceptions of collective control, knowledge, and

investment along with their perceptions of CPO. Having thus examined feelings of CPO at the individual level, where they originate, in Study 4 we assessed CPO as a shared emergent state at the collective level (Kozlowski & Klein, 2000) by aggregating individual scores on items that used a collective referent.

The present research has several strengths. The development of a measure for OAEs was theory driven and employed a rigorous process of scale development and empirical validation. Specifically, a literature review and expert input were used to generate items, and exploratory and confirmatory factor analyses were conducted on two different samples. The validated scale for the OAEs can assist in future research on CPO in different team contexts and with different work products. Additionally, to clarify the CPO antecedents and consequences, we used two-wave and three-wave lagged designs to account for the development of CPO across time and to reduce possible concerns regarding common method bias. The present research contributes to theory regarding team emergent states by addressing calls by Kozlowski and Klein (2000) for more precise theory regarding the steps leading to the emergence of specific phenomena. In doing so, the current research strengthens the conceptual foundation for CPO by combining theories of self-extension (e.g., Belk, 1988) with the emergence literature to propose micro-processes that lead to CPO emergence. In particular, we detailed how feelings of ownership toward work products contribute to workers' sense of self-continuity, which can ease changes and transitions (Anderson, 1985, as cited in Belk, 1988). An important contribution of the current research lies in proposing how at the team level, self-extension into a shared work product would happen through the interactive dynamics between team members with each other and in relation to the team's task. In turn, these shared experiences are expected to be important in clarifying the alignment between the formal distribution of tasks and the actual fulfillment of team member

roles (e.g., McGrath, Arrow, & Berdahl, 2000), resulting in team members acknowledging co-ownership of the work product. From a managerial perspective, the current research shows the importance of employees' feelings of ownership toward collectively developed intangible (e.g., a project idea developed by a team) or tangible products (e.g., the project implementation report written by all team members). Feeling that a product is "ours" increases intentions to promote and engage in extra role behaviors on behalf of the team product and strengthens positive feelings toward the team and desires to remain a part of the team. Given these positive outcomes of CPO, organizations should create opportunities for all employees to exercise control over, familiarize themselves with and invest themselves in the products of collective work. However, organizations also need to make sure that employees interact in relation to shared products and are aware of the work-product-related experiences of fellow team members, in relation to both intangible and tangible work products. Only when team members feel that they all have experienced OAEs regarding a teamwork product will feelings of "me and mine" become feelings of "us and ours." Feedback training programs focused on encouraging team members to acknowledge and evaluate other team members' participation in decision making (control), familiarity with the task (intimate knowledge), and contributions to the collective product (investment) are one way in which feelings of CPO can be nurtured within teams. These training programs may be especially important to maintaining a deep connection to the teamwork product within teams that experience changes in membership.

At the team level, the three OAEs contributed to the formation of CPO when combined in a single, more holistic perception. Future research should continue to explore these constructs at the group level to more completely understand CPO as a shared feeling in teams. In addition, although we have demonstrated that CPO has important effects not only on intentions toward the

work product but also on individual evaluations of team effectiveness, all the data were self-reported. Future research should also investigate the effects of CPO on objective indicators of performance (such as client satisfaction or supervisor ratings).

Our studies have several limitations that should be addressed in future research. A puzzling result of our investigation is that when all three OAEs were simultaneously considered—and in contrast to previous studies on the development of job-based PO (Brown, Pierce, & Crossley, 2014)—the relationships between control and CPO were not significant. It seems possible that which one of the three OAEs leads to CPO depends on the nature of the collective work output and/or on idiosyncratic team characteristics and typologies (e.g., Sundstrom, De Meuse, & Futrell, 1990; Hollenbeck, Beersma, & Schouten, 2012), which can influence the control exercisable by team members. It is possible that the lower Cronbach's alpha values across the four studies for the control subscale (.63 - .72) could indicate that control is not as universally important to CPO over team work products, as the intimate knowledge and investment subscales. For example, a military action and negotiation team works in brief performance events in which control over the output is only shared among a subset of team members, depending on their specific role and status. Rather, the control subscale may influence CPO only in contexts where team member control over the work product is possible and can be expected. Future research might investigate how team types (e.g., according to skill differentiation, authority differentiation, and temporal stability) can influence the emergence of CPO (Hollenbeck, Beersma, & Schouten, 2012). Future research might also investigate the degree of effective control that the team exercises over a team product, in addition to the degree of sharedness of control among team members. Repeated measures of the OAE and of CPO should be collected in future research, in order to provide a stronger test of causality and to

investigate the possible recursive nature of the relationship between them.

We contributed toward the examination of the nomological network of CPO, testing its antecedents and consequences and the discriminant validity from team identification, affective commitment, and IPO. In future research, the current work should be extended by testing against/within a nomological network of other team constructs, such as collective feelings of authentic pride (Tracy & Robbins, 2007), which may act both as an antecedent and consequence of CPO that recursively feeds the link between CPO and OAEs. Future research should also focus on the impact of teamwork design on CPO. For instance, the lack of task identity (the extent to which the group does not contribute to a complete task from beginning to end) may create a disconnect between their collective efforts and the products created, which can lead to work alienation (Chiaburu, Thundiyil, & Wang, 2014).

Another interesting area for future research could build on the conceptualization of CPO as having both cognitive and affective aspects (Pierce & Jussila, 2010). It would be interesting to investigate if the different sources of team identification proposed by Henry, Arrow, and Carini (1999) - identification, interdependence and cohesion - lead to cognitive-based versus affect-based CPO, and to different kinds of outcomes. Furthermore, it is also important to study the possible negative aspects of CPO, such as envy, territoriality, selfishness and hostility toward other groups or even toward individuals within a team who are perceived as a threat to a valued collective product.

Future research should empirically examine the emergence of CPO over time. One intriguing possibility that merits examination is if CPO will develop in a recursive fashion, whereby OAEs influence CPO, which then would cause team members to increase their control, knowledge of and investment in the team output. Feelings toward the team might also result from

CPO and develop in parallel, rather than just serving as a necessary condition, as we have assumed here.

### **Conclusions**

Given the potential benefits of employee feelings of shared ownership in teamwork products, organizations and managers can benefit from better understanding the antecedents and consequences of CPO over and above feelings of individual ownership and attitudes toward the team itself. We hope that the current research has taken an important step forward by validating a scale for measuring key antecedents, testing a model that clarifies how feelings of CPO are formed among team members through OAEs and, in turn, how feelings of CPO positively impact the attitudes and intentions of team members toward the team and its collective work products.



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Table 1

*Studies overview*

Study	Main purpose	Level of analysis	Study Design	Key findings
1a -1b	Item development and psychometric validation of the OAEs scale	Individual	<p><b>Sample 1</b> Workers with team work experience N=210 Method: Cross-sectional survey</p> <p><b>Sample 2</b> Workers with team work experience N=140 Method: Cross-sectional survey</p>	EFA and CFA confirmed 3 OAEs; final scale with 12 items.
2.	Relationship between the OAEs and CPO	Individual	<p><b>Sample</b> Workers with team work experience N=183 Method: Two-wave survey</p>	All OAEs (T1) correlate with CPO (T2). When all three OAEs included, investment and knowledge relate to CPO; control does not.
3.	a) Discriminant validity of CPO. b) Mediating role of CPO in the relationship between the OAEs and team workers' team effectiveness evaluations, team turnover intentions, and championing intentions	Individual	<p><b>Sample</b> Employees working in team projects N=200 Method: Three-wave survey</p>	CPO is distinct from identification, affective commitment and IPO. CPO (T2) mediates the relationships between: knowledge and investment (T1) and a) team effectiveness evaluations b) team turnover intentions, and c) intentions to champion team work output (all measured at T3).
4.	Relationship between the OAEs and CPO as an emergent state at the team level	Team	<p><b>Sample</b> Teams participating in a 5-week challenge, N=48 Method: Two-wave survey</p>	OAEs (T1, measured as a second-order factor) relate to CPO (T2, aggregated to team level from individual scores)

*Notes:* OAEs = ownership activating experiences (control, intimate knowledge and investment); CPO = collective psychological ownership; IPO = individual psychological ownership.

Table 2

*Study 1—Exploratory Factor Analysis*

		Component		
		Inv.	Know.	Cont.
1	All of us invested a lot of time to improve this TWO <sup>a</sup>	<b>.859</b>	-.088	.042
2	We all invested ourselves into this TWO to make it the best it could be.	<b>.845</b>	-.027	.038
3	This TWO was made thanks to the energy invested into it by all of us.	<b>.829</b>	.114	-.169
4	The final TWO reflects the substantial effort put into it by all of us.	<b>.810</b>	.035	-.082
5	All of us invested great effort to create this TWO.	<b>.786</b>	-.014	.078
6	This TWO feels like one that we all made significant investments into.	<b>.726</b>	.044	.042
7	All of us spent a great deal of energy to build the TWO.	<b>.719</b>	.040	.130
8	The energy spent to produce the TWO came from all of us.	<b>.690</b>	.222	-.028
9	We all put a lot of ourselves into this TWO.	.523	.152	.182
10	All of us are very familiar with the characteristics of this TWO.	-.008	<b>.903</b>	-.075
11	All of us in the team are knowledgeable about the TWO.	-.078	<b>.842</b>	.016
12	All of us know this TWO very well.	.142	<b>.822</b>	-.097
13	We all can explain the TWO very well.	.024	<b>.769</b>	.012
14	All of us know this TWO in detail.	.187	<b>.648</b>	.043
15	The details of this TWO are very familiar to all of us.	.096	<b>.642</b>	.106
16	We all know the details of the TWO.	.166	.532	.154
17	In this team, we all had power over the development of the TWO.	-.108	.036	<b>.868</b>
18	All of us had control over how this TWO developed.	.175	-.204	<b>.848</b>
19	Together, we all had a lot of control over how the TWO was created.	-.003	.028	<b>.767</b>
20	We all had some power over the development of the TWO.	-.195	.401	<b>.601</b>
21	We all exercised substantial control during development of the final TWO.	.317	-.004	.490
22	We all know how this TWO is different than other TWO.	.130	.190	.299

*Notes:* Extraction method: Principal component analysis. Rotation method: Promax with Kaiser normalization; Rotation converged in six iterations; <sup>a</sup>TWO = Teamwork output; Inv = Investment; Know = Intimate knowledge; Cont = Control

Table 3

*List of Final Items*

<b>Dimension</b>	<b>Item</b>
<b>Control</b>	<p>All of us had control over how this TEAMWORK OUTPUT developed.</p> <p>In this team, we all had power over the development of the TEAMWORK OUTPUT.</p> <p>Together, we all had a lot of control over how the TEAMWORK OUTPUT was created.</p> <p>We all had some power over the development of the TWO.</p>
<b>Knowledge</b>	<p>All of us are very familiar with the characteristics of this TEAMWORK OUTPUT.</p> <p>We all know this TEAMWORK OUTPUT very well.</p> <p>All of us in the team are knowledgeable about the TEAMWORK OUTPUT.</p> <p>We all can explain the TEAMWORK OUTPUT very well.</p>
<b>Investment</b>	<p>This TEAMWORK OUTPUT was made thanks to the energy invested into it by all of us.</p> <p>All of us invested great effort to create this TEAMWORK OUTPUT.</p> <p>This TEAMWORK OUTPUT feels like one that we all made significant investments into.</p> <p>All of us spent a great deal of energy to build the TEAMWORK OUTPUT.</p>

Table 4

*Study 2—Descriptive Statistics, Internal Consistency Reliabilities, and Correlations*

	Variable	<i>M</i>	<i>SD</i>	4	5	6	7
1.	Age	46.9	12.1				
2.	Gender <sup>a</sup>	.57	.50				
3.	Work Experience	23.9	11.2				
4.	Control	3.39	.54	(.63)			
5.	Knowledge	4.27	.63	.27**	(.88)		
6.	Investment	4.22	.66	.17*	.52**	(.89)	
7.	CPO <sup>b</sup>	4.20	.63	.17*	.39**	.35**	(.92)

*Notes:* *N* = 183; internal consistency reliabilities appear in parentheses along the diagonal;

<sup>a</sup>dummy coded: 1 = male, 0 = female; <sup>b</sup>CPO = collective psychological ownership; \*\**p* < .001

\*\**p* < .05.

Table 5

*Study 3—Descriptive Statistics, Internal Consistency Reliabilities and Correlations*

Variable	<i>M</i>	<i>SD</i>	4	5	6	7	8	9	10	11	12	13
1. Age	35.2	10.3										
2. Gender <sup>a</sup>	.56	.50										
3. Work Experience	14.6	10.0										
4. Control	4.23	.86	(.72)									
5. Knowledge	4.14	.74	.09	(.90)								
6. Investment	4.09	.71	.16*	.53**	(.91)							
7. CPO <sup>b</sup>	4.06	.79	.22**	.41**	.42**	(.93)						
8. Turnover Intentions	1.72	.97	-.02	-.37**	-.37**	-.39**	(.95)					
9. Effectiveness	4.24	.71	.23**	.31**	.31**	.51**	-.47**	(.81)				
10. Championing	3.85	.88	-.04	.15*	.22**	.32**	-.33**	.35**	(.92)			
11. Team Identification	3.81	.79	.08	.35**	.49**	.44**	-.25**	.29**	.37**	(.74)		
12. Affective Commitment	3.69	.91	.04	.30**	.49**	.44**	-.44**	.30**	.39**	.49**	(.87)	
13. IPO <sup>c</sup>	3.31	.97	.10	.00	.06	.12	-.07	.21**	.33**	.21**	.19**	(.91)

*Notes:* N = 200; internal consistency reliabilities appear in parentheses along the diagonal; <sup>a</sup>dummy coded: 1 = male, 0 = female;

CPO<sup>b</sup> = collective psychological ownership; IPO<sup>c</sup> = individual psychological ownership; \*\*p < .001 \*p < .05.

Table 6

*Study 3—CFA Models*

Model	$\chi^2$	df	RMSEA	CFI	TLI	SRMR	$\chi^{2DIF}$
1 1 Factor	2796.137	464	.159	.437	.398	.136	1983.039***
2 3 Factor (OAE, IPO, CPO), Identification, Commitment	2420.388	461	.146	.527	.491	.134	1607.290***
3 4 Factor (IPO, CPO), (OAE), Identification, Commitment	2189.102	458	.138	.582	.547	.191	1376.004***
4 6 Factor (IPO, CPO), Control, Knowledge, Investment, Identification, Commitment	1708.108	449	.118	.696	.664	.103	895.010***
5 6 Factor (Commitment, CPO), Control, Knowledge, Investment, Identification, IPO	1204.948	449	.092	.817	.798	.084	391.850***
6 6 Factor (Identification, CPO), Control, Knowledge, Investment, IPO, Commitment	960.692	449	.075	.876	.863	.084	147.59***
7 7 Factors	813.098	443	.065	.911	.900	.064	

*Notes:* df = degrees of freedom,  $\chi^{2DIF} = \chi^2$  difference (tested in relation to the hypothesized seven-factor model) \*\*\*p < .0001

Table 7

*Study 3—Direct and Indirect Path Coefficients of the Hypothesized Model*

<i>Paths</i>	$\beta$	<i>SE</i>	<i>p</i>	CI 95%	
				<i>lower</i>	<i>upper</i>
Control → CPO	.17	.10	.098		
Knowledge → CPO	.26	.10	.007		
Investment → CPO	.27	.11	.013		
CPO → Effectiveness Evaluations	.34	.09	.000		
CPO → Turnover Intentions	-.37	.13	.005		
CPO → Championing Intentions	.40	.12	.001		
Control → CPO → Effectiveness Evaluations	.06	.03	.098	.01	.12
Control → CPO → Turnover Intentions	-.06	.04	.148	-.15	-.01
Control → CPO → Championing Intentions	.06	.05	.139	.02	.16
Knowledge → CPO → Effectiveness Evaluations	.09	.04	.031	.04	.18
Knowledge → CPO → Turnover Intentions	-.10	.05	.067	-.22	-.03
Knowledge → CPO → Championing Intentions	.11	.05	.038	.04	.22
Investment → CPO → Effectiveness Evaluations	.09	.04	.035	.04	.19
Investment → CPO → Turnover Intentions	-.10	.05	.048	-.22	-.04
Investment → CPO → Championing Intentions	.11	.05	.039	.05	.23

Note: Indirect paths calculated with 10,000 bootstraps

Table 8

*Study 4—Descriptive Statistics and Correlations*

	Variable	<i>M</i>	<i>SD</i>	Rwg(j)	1	2	3
1.	Control	5.88	.71	.88			
2.	Knowledge	6.04	.69	.91	.84**		
3.	Investment	5.57	.99	.83	.67**	.93**	
4.	CPO <sup>a</sup>	6.24	.98	.96	.37*	.55*	.43*

*Notes:* N = 48 teams; CPO<sup>a</sup> = collective psychological ownership; \*\*p < .001 \*p < .05.