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Development of a Leadership training program for Principal Investigators in the area of Health and Life Sciences

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Master in Human Resources Management and Organizational Consulting

Supervisor:

PhD Patrícia Lopes Costa, Assistant Professor,
ISCTE Business School

May, 2023



BUSINESS
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Department of Human Resources and Organizational Behavior

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This is your achievement too!

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Abstract

Research teams operate in a very demanding environment. In this stressful context, Principal Investigators (PIs) play an essential role, not only to ensure the project completion, but also to foster team effectiveness. Although leadership skills are crucial, PIs tend to focus more on scientific competencies, resulting in a significant training gap in leadership and management skills. While several models of team leadership exist in the literature, this study focused on the functional leadership approach, which identified 15 essential team leadership functions that impact on team performance (Morgeson et al., 2010). In order to understand which functions are most relevant in this context, both qualitative and quantitative methods were conducted. This comprised individual interviews with 10 PIs, and 2 Focus groups with team members (with a total of 11 participants), from 4 different Research Institutes. Additionally, 28 PIs from 6 different Research Institutes participated in the survey. The results revealed six key competencies that needed improvement, especially focusing on transition processes (Train and develop team, Establish expectations and goals, Structure and plan), and interpersonal processes (Adapt style to people, Conflict management, Motivate the team). Based on these findings, a 15-hour training program was designed to provide tools to improve these competencies, helping PIs from Research Institutes boosting their leadership strategies and practices towards a more effective team performance. Additionally, a training evaluation proposal and an analysis of the project's limitations and potential improvements are also provided.

Keywords: Leadership; Research teams; Leadership training; Health and Life Sciences

JEL Classification: I23 (Research Institutions); O15 (Human Resources)

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Resumo

As equipas de investigação operam num ambiente muito exigente. Neste contexto, os Investigadores Principais (*PIs*) desempenham um papel essencial, não só para garantirem a conclusão dos projetos, mas também para promoverem a eficácia das equipas. Embora as competências de liderança sejam cruciais, os *PIs* tendem a centrar-se mais nas competências científicas, resultando numa lacuna significativa a nível das competências de liderança. Embora existam vários modelos de liderança de equipa, este estudo focou-se na abordagem da liderança funcional, que identificou 15 funções essenciais de liderança de equipas, com impacto no seu desempenho (Morgeson et al., 2010). De modo a compreender quais as funções mais relevantes neste contexto, foram realizadas entrevistas individuais com 10 *PIs*, e 2 grupos focais com membros de equipa (11 elementos no total), provenientes de 4 Institutos de Investigação diferentes. Além disso, 28 *PIs* participaram no questionário. Os resultados revelaram seis competências-chave para serem trabalhadas, enquadrando-se sobretudo em processos de transição (Treinar e desenvolver a equipa, Estabelecer expectativas e objetivos, Estruturar e planear), e em processos interpessoais (Adaptar o estilo às pessoas, Gerir conflitos, Motivar a equipa). Com base nestas conclusões, foi desenhado um programa de formação com 15 horas para promover ferramentas que permitam melhorar essas competências, ajudando os *PIs* a impulsionar as suas estratégias e práticas de liderança no sentido de promover um desempenho mais eficaz das suas equipas. Adicionalmente, é também apresentada uma proposta de avaliação da formação, bem como uma análise das limitações e potenciais melhorias.

Palavras-chave: Liderança; Equipas de investigação; Saúde e Ciências da Vida

Classificação JEL: I23 (Institutos de Investigação); O15 (Recursos Humanos)

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List of Abbreviations

CEDOC-NMS – Centro de Estudos de Doenças Crónicas - Nova Medical School

FCT – Fundação para a Ciência e Tecnologia

iBET – Instituto de Biologia Experimental e Tecnológica

IGC – Instituto Gulbenkian de Ciência

iMM – Instituto de Medicina Molecular João Lobo Antunes

IPO – Input-Process-Output

ITQB NOVA – Instituto de Tecnologia Química e Biológica António Xavier

MIT – Massachusetts Institute of Technology

NIH – National Institutes of Health

PhD – Doctor of Philosophy

PI – Principal Investigator

R&D – Research and Development

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CHAPTER 1

Introduction

Scientific research consists of a systematic collection, interpretation and evaluation of data, in a planned manner, in order to find explanations about certain phenomena or answers to specific questions. This process is critical for the advance of our knowledge and, ultimately, to improve our practices in many different areas (evidence-based practice). In fact, good quality research provides evidence that is robust, ethical, stands up to scrutiny and can be used to inform policy making.

A research team is defined as a group of researchers that collaborate to produce scientific results, which are primarily communicated in the form of research articles (Milojević, 2014). In fact, scientific productivity is commonly and heavily measured by the number of publications and impact (measured by citations) (Abramo & D'Angelo, 2014). For this reason, many laboratory researchers would preferably aim for high impact journals, as publishing in one demonstrates that their research achieved a high standard, and it translates to prestige, enhances their credibility, and increases the likelihood of their paper being read and cited (Waters, 2021). Although, if we look into the editorial process of a high impact journal, such as Nature, it is possible to observe its level of demand, as its criteria for publication state that scientific articles need to 1) report original scientific research (should not be published or submitted elsewhere), 2) be of outstanding scientific importance, and 3) reach a conclusion of interest to an interdisciplinary readership (Nature, 2023). Apart from the rigorous standards they have to meet, researchers are also limited by time constraints, as most of them also fear to be scooped (i.e., other researchers publish similar findings before). While some studies suggest the impact of being scooped is not as harmful as one believes (Callaway, 2019; Kim & Corn, 2018), it was shown that scooped articles, if ever published, receive less citations than the ones that were first published, and tend to appear in less prestigious journals (Callaway, 2019).

Therefore, research teams operate in a very demanding environment, with a constant pressure for innovation. Aiming for new discoveries involves taking risks and stepping into the unknown, which comes with a high likelihood of failure and rejection before achieving success (Parkes, 2019). This can be very discouraging for team members, and the racing for results might lead to lower quality standards (O'Grady, 2021).

In this stressful context, Principal Investigators (PIs) play an essential role, not only for setting individual goals and provide guidance, but also to promote cooperation, to keep the team motivated and focused, and to support individual development. Despite the importance of these

leadership skills, the main competencies PIs develop are most exclusively Science related, such as project design, planning and execution, scientific writing (hard skills) or ability to work under pressure, resilience, self-confidence (soft skills), among others. This situation is reinforced by science funding organizations, that for leadership evaluation mainly consider criteria related to scientific performance and work experience (Yu et al., 2019).

For example, Fundação para a Ciência e Tecnologia (FCT), the Portuguese national funding agency for science, research and technology, includes four main criteria to evaluate and select scientific projects: 1) Scientific merit and innovative nature of the project from an international standpoint; 2) Scientific merit of the Principal Investigator and the research team; 3) Feasibility of the work plan and reasonability of the budget; and 4) Contribution to the body of knowledge in the field and improvement in the competence of the scientific community (FCT, 2022; FCT & MIT Portugal, 2022).

Thus, despite the extensive research training of these leaders, they face a relevant training gap in leadership and management skills. This gap, if not properly filled, can lead to unsuccessful goal achievements and, ultimately, project failure, which may compromise future funding to support the group and its research. Additionally, it is fairly easy to find multiple reports documenting students' toxic experiences with their supervisors, resulting in a significant number of them dropping out of their degree programs (Gorup & Laufer, 2020; Young-Powell, 2018). Unfortunately, such reports are not uncommon, indicating that this is a widespread problem that needs to be addressed.

For these reasons, it is important that PIs are trained and capable of managing and supporting their team members, as well as promoting a positive culture that contributes to the team performance. Therefore, this project aims to help PIs (specifically from the area of Life and Health Sciences) improving their leadership strategies and practices towards a more effective team performance by (1) identifying the main gaps on their leadership skills and (2) designing a customized training program that manages to fill these gaps.

This project is divided into five chapters: Introduction, Literature review, Methods, Results and Intervention. The *Literature review* will mostly focus on research groups, functional leadership, and leadership training. The *Methods* chapter will describe the approach used to collect and analyze data, including both qualitative and quantitative research methods. The *Results* chapter presents and discusses the most relevant findings from this research, which includes a summary of the leadership gaps identified. Finally, the Intervention proposal chapter suggests and discusses a training plan designed for research leaders based on the identified leadership gaps.

CHAPTER 2

Literature Review

In this chapter, a thorough review of the relevant literature for the purpose of this project will be presented. The review is organized thematically to provide a clear and concise summary of the current state of knowledge in each topic.

2.1. Scientific Research context

2.1.1. Research funding

Scientific research in Portugal takes place mainly within a network of research and development (R&D) units that belong to public universities and state-managed autonomous research institutions. Additionally, some non-state-managed research institutions and private R&D projects developed by companies also contribute to the research system.

The Ministry of Science, Technology, and Higher Education holds the authority to fund this research system, mainly through the Fundação para a Ciência e Tecnologia (FCT) - a public agency created in 1997 to fund research in science, technology, and innovation. FCT supports researchers of any nationality across all fields of knowledge through various funding instruments. These instruments are designed to support scientists, research teams, and R&D units by promoting advanced training, research and development, creation of research infrastructures, and access to them, fostering international networks and collaborations, organizing conferences, and promoting science communication and interaction with companies (Fundação para a Ciência e Tecnologia, 2023).

Despite offering funding opportunities across various scientific and technological domains, securing funding from FCT can be challenging. For example, in 2022, the overall success rate for the its Call for R&D Projects in All Scientific Domains was only 15.5% (Fundação para a Ciência e Tecnologia, 2022). While this may seem low, it is comparable to other funding agencies. In the United States, the National Institutes of Health (NIH), the largest public funder of biomedical research globally, has an average application success rate of approximately 20% (NIH, 2023). For this reason, it is possible to find published articles that discuss strategies and principles for scientists to increase their chances of obtaining and sustaining funding for their research projects due to the competitive nature of grant applications (Chernoff, 2018).

2.1.2. Research group structure

A scientific research team is a group of individuals collaborating to successfully complete a research project, with the aim of producing scientific results primarily communicated through research articles (Milojević, 2014).

Each research group is composed of a Group Leader and a team with the skills to conduct research projects. The team may include Postdoctoral researchers, PhD students, Master's students, and Research technicians. Some groups may also have senior Postdoctoral researchers, also known as Research Fellows.

Group Leaders are experienced researchers who coordinate the research groups and are generally affiliated with the Institution. Their responsibilities include aligning the objectives and activity plan of their group with the strategic priorities defined by the organization and actively contributing to the organization's mission. They are also responsible for the day-to-day management of their respective research groups, ensuring that quality scientific content is produced and published, promoting the capture of funding that ensures the pursuit of the group's research work, and contributing to pre and postgraduate education. Additionally, Group Leaders should act as representatives of their respective research groups.

The Research Fellow is a highly qualified Postdoctoral researcher with a minimum of 4 years of experience, relevant scientific production, and demonstrated capacity for funding capture. The Research Fellow's responsibilities are usually defined in an agreement between the Research Fellow, the Group Leader, and the Institution. This agreement should outline the Research Fellow's level of scientific independence within the research group, its intellectual property rights of scientific articles, its framework in applications for research project funding, and its responsibilities in supervising PhD or Master's students, among other things (Regulamento n.º 709/2019, de 10 de Setembro Da Universidade Nova de Lisboa - Faculdade de Ciências Médicas, 2019).

For the purpose of this project, it is important to define Principal Investigator as well. When applying for a grant, FCT considers Principal Investigators to be PhD holders for more than 5 years, with a relevant curriculum in the scientific area to which they are applying, demonstrating scientific independence in the last 3 years. This means that Research Fellows or even Group Leaders can also be (and most likely are) Principal Investigators of the projects they are working on.

2.2. Research teams

Work teams can be defined as “two or more individuals who socially interact, possess one or more common goals, are brought together to perform organizationally relevant tasks, exhibit interdependencies with respect to workflow, goals, and outcomes, have different roles and responsibilities and are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment” (Kozlowski & Ilgen, 2006).

Work teams can take different forms, and there are several attempts to classify them. The different types of teams are usually distinguished based on factors such as the nature of the teams’ tasks, their organizational context, and their size and tenure (Kozlowski & Bell, 2003). For example, Sundstrom and colleagues (2000), building on the work of other researchers, managed to integrate a wide range of teams into a General typology that comprises of six categories: (1) production, (2) service, (3) management, (4) project, (5) action and performing, and (6) advisory.

Production teams consist of front-line employees who repeatedly produce tangible outputs (e.g., automobile assembly) and can range from supervisor-led to semi-autonomous to self-directed. *Service teams* collaborate to carry out recurring tasks involving customer interactions (e.g., airline attendants) and may have management responsibilities or be self-managed. *Management teams* are composed of an executive or senior manager and other managers or supervisors who directly report to them. They work together to coordinate the activities of the work units they are responsible for (e.g., policy-making) and have the freedom to organize themselves as they choose. *Project teams* are temporary groups of individuals assembled to complete specific projects in a specialized, predetermined period, after which they are disbanded (e.g., new product development). These teams are usually cross-functional, as members come from various departments or units. *Action and performing teams* are composed of experts that carry out interlinked roles in complex and time-limited performance events (e.g., surgery teams). Finally, *advisory teams* are temporary work groups that managers assemble to solve problems and recommend solutions (e.g., selection committees) (Sundstrom et al., 2000).

According to Milojević (2014), a research team is “a group of researchers collaborating to produce scientific results, which are primarily communicated in the form of research articles”. In fact, scientific research groups carry out defined, specialized, time-limited projects aimed at answering a specific research question or solving a particular scientific problem. These groups often involve researchers from different areas, departments or institutions who collaborate and coordinate their efforts to achieve a common goal. Scientific research projects require a high

degree of expertise and specialization, with team members carrying out complementary roles and tasks. Once the research project is complete, the group may disband or move on to another project. Therefore, based on these characteristics, it is reasonable to consider scientific research groups as a type of project team.

2.3. Team effectiveness

The production of high-quality research outcomes relies heavily on the effectiveness of research teams. The team effectiveness is usually based on an input-process-output (I-P-O) model suggested by McGrath (1964). In this model, the Inputs refer to antecedent factors at an individual level (e.g., skills, personality), group level (e.g., structure, size) and environment level (e.g., organization context, task characteristics). Processes refer to how the group interacts toward project completion. Outputs refer to the results of this interaction (i.e., team effectiveness), which comprises not only team performance outcomes (e.g., quality of work, number of errors), but also team viability (i.e., the willingness of members to work together in future projects) and members' satisfaction (i.e., meeting their needs) (Hackman, 1987; Sundstrom et al., 1990).

Several studies have examined team effectiveness by testing different factors on specific types of teams. However, it's important to recognize that what works best for one type of team may not necessarily work as well for another due to the different contexts and the specific desired outcomes. For example, regarding team size, while some studies argue that larger teams are more effective because they may have greater access to resources such as time, energy, money, and expertise (Hill, 1982), others suggest that smaller teams demonstrate better teamwork, as they provide for more direct and efficient intrateam communication (Bray et al., 1978; Hoegl, 2005). However, these studies use different types of teams (either isolated or all together), making it hard to take solid conclusions.

In the context of project teams, an outcome may include timely completion, efficient use of resources, or quality of the product (Mathieu et al., 2015), and it's known that research outcomes are significantly impacted by team diversity and interpersonal skills, as they affect critical aspects of team function like communication patterns, problem-solving, and group creativity (Cheruvilil et al., 2014). Additionally, it is worth noting that the context in which research teams operate can also impact their success, such as the physical space, the culture of the organization, the availability of resources and the funding level (Cheruvilil et al., 2014).

While the I-P-O model is a useful organizing framework, it represents a static perspective on team effectiveness. In fact, teamwork is characterized by temporal cycles of activities that

can be divided into two distinctive phases: transition and action (Marks et al., 2001). In the transition phase, teams focus on evaluation and planning activities designed to accomplish a team goal. In the action phase, teams perform work activities that directly contribute to goal accomplishment. Over time, teams repeatedly cycle through transition and action phases. In addition, during both phases, interpersonal processes must be managed, which entails conflict management, building team's motivation and confidence and regulating their emotions. Besides, it is important to notice that teams are often engaged in different tasks at the same time, that are in different phases, which reinforces the need for leaders to be adaptive (Marks et al., 2001). This brings an important component to this equation – Leadership – as leaders also play a crucial role when it comes to manage team processes.

2.4. Functional Leadership

According to Yammarino (2013), “leadership is a multi-level leader-follower interaction process, that occurs in a particular situation, where leader and followers share a purpose and jointly accomplish things, willingly” (Yammarino, 2013) . In fact, leaders are expected to facilitate the development of a direction for the team, align the efforts of team members, and engage and motivate them to accomplish that direction (Day & Dragoni, 2015).

There are several models concerning team leadership. Many of them focus on the leader itself (who the leader is), such as the leadership style approach (Yukl et al., 2002). Some organizations, such as Research Institutes, deal with several groups that are led by many different people, with many different styles. Therefore, it might be more useful to focus on what the leader should do (how the leader interacts with the situation). In this perspective, one of the most well-known team leadership models is the functional leadership approach, which is oriented around the satisfaction of critical team needs to foster team effectiveness (Morgeson et al., 2010). As Hackman and Walton (1986) describe, “if a leader manages, by whatever means, to ensure that all functions critical to both task accomplishment and group maintenance are adequately taken care of, then the leader has done his or her job well” (Hackman & Walton, 1986, p. 75).

In order to present an integrative view of team leadership, Morgeson and colleagues (2010) summarized the literature focusing on the role of leadership on team performance and identified 15 relevant team leadership functions that occur during transition and action phases. They suggested that, during the transition phase, important team leadership functions include: Compose team, Define mission, Establish expectations and goals, Structure and plan, Train and develop team, Sensemaking and Provide feedback. These enables the team to engage in actions

that contribute directly to goal accomplishment. During the action period, team leadership functions consists on: Monitor team, Manage team boundaries, Challenge team, Perform team task, Solve problems, Provide resources, Encourage team self-management and Support social climate (Morgeson et al., 2010). A more detailed description of each task is provided below:

Compose team: This task involves selecting and organizing individuals to form a team that is best suited to accomplish a particular goal or mission. The team composition process should consider factors such as individual skills, knowledge, and personality traits to ensure that the team functions effectively.

Define mission: Defining the team's mission is a critical task that involves articulating the team's purpose, goals, and objectives. A clear mission statement can help team members understand the importance of their work and how it contributes to the overall success of the organization.

Establish expectations and goals: Once the team's mission is defined, it is essential to establish clear expectations and goals for each team member. This task involves setting performance standards and providing guidance on how to achieve them.

Structure and plan: Structuring and planning involve determining the roles and responsibilities of each team member and establishing procedures for communication and decision-making. This task helps to ensure that team members understand their individual contributions to the team's success and have a clear understanding of how the team will work together to achieve its goals.

Train and develop team: To perform effectively, team members must have the necessary knowledge and skills to complete their assigned tasks. This task involves providing training and development opportunities to team members to ensure that they have the skills and knowledge needed to succeed.

Sensemaking: This task involves team leaders interpreting and understanding complex situations or information to make sense of them for the team. It also involves communicating this sensemaking to team members to ensure everyone is on the same page.

Provide feedback: Leaders need to provide team members with feedback on their performance to help them improve their work. This task involves not only providing feedback but also framing it in a way that motivates team members and helps them grow.

Monitor team: Leaders need to keep an eye on how their team is performing to ensure it's on track to meet its goals. This task involves regularly checking in on the team's progress, identifying any problems, and taking corrective action when needed.

Manage team boundaries: Teams don't exist in a vacuum, so leaders need to manage the boundaries between their team and other teams or departments. This task involves ensuring that team members have the resources they need to do their work and that they're communicating effectively with other teams.

Challenge team: Leaders need to push their teams to achieve their full potential. This task involves setting challenging goals and encouraging team members to stretch themselves beyond their comfort zones. It also involves providing support and resources to help team members meet these challenges.

Perform team task: This task involves taking a more active approach in the team's work, by actively contributing, intervening, or executing some of the team's duties. In other words, it is when leaders "roll up their sleeves" and help team members to get the work done.

Solve problems: The team leader must be able to identify and solve problems that arise within the team. This includes actively participating or backing up the team in evaluating problems, creating solutions, and executing them.

Provide resources: The team leader must ensure that the team has the resources it needs to be successful. This includes providing access to tools, materials, and information, as well as allocating personnel and other resources as needed.

Encourage team self-management: The team leader should empower team members to manage themselves by creating a supportive environment where team members can take initiative and make decisions.

Support social climate: The team leader should promote a positive social climate within the team, fostering a sense of trust and cooperation among team members. This involves building strong relationships, creating opportunities for team members to collaborate and communicate effectively, and promoting a culture of respect and inclusion.

This integrative view, where the specific functions of each phase are described and detailed, is very useful in terms of evaluation (also because this study provides survey items that can be used in team leadership research) and, consequently, for the implementation of specific actions for interventions.

According to Zaccaro and colleagues (2001), these leadership functions, in turn, impact on team effectiveness through cognitive, motivational, affective and coordination processes.

Several studies have shown the importance of *Cognitive processes* on team performance. For example, Cannon-Bowers and colleagues (1993) have suggested that shared mental models help team members anticipate each other's actions, thereby reducing the need for excessive processing and communication, resulting in better coordination and performance. Zaccaro and

colleagues (2001) proposed that leaders can influence key components of team cognition by engaging in sense-making and sense-giving activities, allowing the development of more comprehensive and effective team mental models, which in turn affect team performance.

In addition to cognitive processes, there is a widespread consensus that motivation plays a crucial role in driving team effectiveness. *Motivational processes* comprise team cohesion (the level of member integration and shared commitment to one another and/or to the common purpose), and collective efficacy (members' beliefs in their capacity to accomplish tasks effectively together). Cohesive groups foster a sense of care and commitment towards the success of other group members, leading to higher effort towards group success. Strong collective efficacy beliefs enhance the likelihood of task engagement, focus and allocation of resources towards task accomplishment, leading to team effectiveness. Leaders can also play an important role towards motivating their teams, either directly through the implementation of motivational strategies, or indirectly through their planning, coordinating, personnel development, and feedback behaviors. In fact, teams whose leaders set challenging goals, motivate, encourage and provide suitable strategies for members to achieve them, exhibit higher team efficacy and cohesion (Zaccaro et al., 2001).

Another key determinant of team effectiveness is *Affective processes*. For example, positive moods among team members foster cooperation, participation, and social cohesion, while collective negative moods lead to conflict and reduced willingness to work together (George, 1996). Zaccaro and colleagues (2001) proposed that teams whose leaders provide clear performance goals, role assignments, and performance strategies display less emotional contagion and react less emotionally to stressful circumstances. Additionally, leaders who establish and promote emotional control norms can reduce affective conflict among team members. These findings suggest that leaders can influence and promote a positive team affective environment by providing clear goals, role assignments, performance strategies, and emotional norms (Zaccaro et al., 2001).

Finally, team effectiveness depends fundamentally upon how well team members can coordinate their actions. *Coordination processes* are used to manage dependencies between activities (Malone & Crowston, 1993), and, according to Fleishman and Zaccaro (1992), include seven main functions: orientation, resource distribution, timing, response coordination, motivational, systems monitoring and procedure maintenance. Leaders can enhance team coordination by aligning individual member skills with role requirements, providing clear performance strategies, monitoring and providing feedback, and adjusting team actions when

external conditions change. Teams with leaders who facilitate such activities display better coordination and, consequently, higher effectiveness (Zaccaro et al., 2001).

In short, and as a matter of fact, several studies have identified leadership and leaders as important players on team processes that lead to team effectiveness (Kozlowski & Ilgen, 2006).

2.5. Leadership Training

There is growing evidence that leadership in teams is important to achieve team performance outcomes (Burke et al., 2006). This supports the idea that leaders need to be trained. In fact, leadership skills are amenable to training interventions. Activities designed to enhance leadership skills (through workshops, coaching or both) lead to improved perceptions of leadership (Kelloway & Barling, 2010). Moreover, Santos and colleagues (2015) have shown that training leaders in functional leadership improves the performance of leadership functions and team effectiveness (Santos et al., 2015). Besides, several empirical research studies have supported that leader behaviors are associated with employee stress and affective well-being (Skakon et al., 2010), what makes leadership development also a viable and effective primary intervention in occupational health psychology. In short, specific training programmes have shown to be effective in modulating leaders' behaviors and team perceptions, with increased team performance and safety.

When designing leadership interventions, there are several aspects to be considered. First, the intensity of the intervention needs to be carefully planned. There is not a clear optimal length of training, although it should have minimal disruption to the workplace. Secondly, it is important to specify the intervening variables to change attitudes, behaviors, motivation and experiences of team members. The outcomes are mainly indirect and have a time lag that is unknown. Finally, it is necessary to consider logistical challenges for evaluation, since the response rates are low and the multiple levels of "matching" can result in a huge data loss (Kelloway & Barling, 2010). Apart from these general logistical aspects, it is critical to have in mind that the most valued leadership functions differ depending on the context characteristics that contribute to team effectiveness (Graça & Passos, 2015). Therefore, it is important to consider the type of team, the context and define specific performance criteria that could help designing more successful interventions.

In short, theory and empirical evidence suggest that leaders play a crucial role in boosting team effectiveness. The development of leadership skills can be achieved through training interventions, and organizations have shown increasing interest in improving leadership

through training, as surveys have indicated that leadership training is one of the most critical training need (Kozlowski & Ilgen, 2006).

2.6. Leadership intervention for research leaders

In general, and at least in Portugal, research leaders have no leadership training by default, which could potentially have adverse effects on the team's processes and, consequently, on team's performance, satisfaction, and viability. Therefore, it would be important to develop and implement a leadership training programme that is specifically tailored to this group. To accomplish this, it is essential to take into account the specific context in which research teams operate. First, they carry out their work within a demanding and stressful environment, with the need for constant learning and innovation. Then, there is a relatively high turnover rate, since research is currently a precarious work, based mostly on fellowship contracts. Concerning the Principal Investigators involved in this project, it is also important to consider that they are inserted in a team where they also report to a group leader (i.e., they are hierarchically below). Moreover, many of them are still starting out in their leadership roles and are typically responsible for managing relatively small groups. Considering this specific context, it is expected that some leadership competencies and functions would be more relevant than others (e.g., establishing expectations and goals or solving problems would probably be more relevant than sensemaking or providing resources). Thus, this project aims to identify the most relevant competencies and functions for scientific research leaders (specifically, Principal Investigators in the area of Life and Health Sciences), by analyzing the perception of required competencies for the job, and identifying which ones, globally, are present and which ones need to be developed/trained. This analysis will then serve as a foundation for the design and development of a training program that aims to improve their leadership strategies and practices towards a more effective team performance.

CHAPTER 3

Methodology

In order to design a training program that aims to improve Principal Investigators (PIs) leadership skills, it is necessary to identify the specific training needs for this target population. For this project, both qualitative and quantitative methods were used for data collection.

3.1. Approach

The coordinator from COLife, which is an alliance between six research institutes in Life Sciences, located in the region of Lisbon and Oeiras, was contacted and the project was presented (Appendix I). The Institutes are: (1) Centro de Estudos de Doenças Crónicas - Nova Medical School (CEDOC-NMS), (2) Champalimaud Research Centre, (3) Instituto de Biologia Experimental e Tecnológica (iBET), (4) Instituto de Medicina Molecular João Lobo Antunes (iMM), (5) Instituto de Tecnologia Química e Biológica António Xavier (ITQB NOVA), and (6) Instituto Gulbenkian de Ciência (IGC). In turn, COLife sent an e-mail with a brief description of the project (specifying the general goals, target groups and general procedures) to all Post-Doc committees, and volunteers would contact back, showing their willingness to participate. After their contact, a thank you e-mail was sent, which included a couple of questions to ensure they fit the criteria and, if so, individual interviews were scheduled. All interviews took place online, via Zoom, and each one lasted on average 78 minutes (SD = 30 min). Permission to record the interviews was requested in the beginning of each interview, and the scope of the project was presented as well. The demographics were requested after the interviews took place. Interviews continued until data saturation was reached (Saunders et al., 2018).

After each interview, an e-mail was sent to each volunteer (PI) asking to forward the information regarding this project to team members they have supervised or were supervising at the moment. Volunteers (team members) would make a direct contact showing their willingness to participate as well. When a sufficient number of volunteers was reached (around 5), the group was invited to a Focus group. The conversations took place online, via Zoom, and lasted approximately an average of 105 minutes (sd = 11 min). Permission to record was requested in the beginning, and the scope of the project was presented as well. The demographics were requested after the interviews took place.

To complement this qualitative approach, the same target population (PIs) was simultaneously invited to take an online survey (also through COLife), for a quantitative

analysis. This survey was expected to take approximately 10 minutes to finish. By the end of the survey, PIs were asked to provide a team code and their team members' emails. Then, an email was sent to those contacts, inviting the team members for a similar survey, where they were requested to introduce the provided code as well. This would allow to match the surveys from the PIs (leaders) and their team members (the people they directly supervise).

For both interviews and surveys, the participation of individuals was voluntary, and their confidentiality was assured.

3.2. Participants

The target population for this intervention are Principal Investigators, which for the scope of this project are defined as researchers that have or have had their own projects, from Life and Health Sciences, that are starting on a leadership role (i.e., are not Group Leaders yet) and are or have been responsible for supervising directly other group members.

To collect information regarding the perceptions of the required competencies for the job, which ones are present and which ones need to be developed, interviews and surveys were conducted not only for PIs themselves, but also for group members that are supervised by them. This strategy enables to understand different perspectives on the same subject (self, peers and subordinates), providing a broader and sharper view on this topic and reducing potential biases. Therefore, it was a non-probabilistic and convenience sampling, since participants should follow specific criteria (Saunders et al., 2009, as cited in Ragab & Arisha, 2018)

For the interviews, 10 Principal Investigators have volunteered (4 from IMM, 4 from ITQB, 1 from IGC and 1 from Champalimaud), mostly Portuguese (90.0%). Regarding gender and age, 60.0% of the participants were female and the ages ranged from 36 to 46 ($m = 41.1$, $sd = 3.7$). The majority, 70.0%, had their own projects for 2 years or less, and 60.0% only had one financed project so far. At the time of the interviews, most PIs (70.0%) were supervising 1-2 group members at the same time (10.0% were not supervising anyone at that moment, 10.0% were supervising 3-4 group members and 10.0% were supervising 5-6), and 50.0% claimed that the maximum number of group members supervised at the same time was 1-2, 30.0% was 3-4 and 20.0% was 5-6. When asked about their 5 years job expectations, 60.0% would like to become a Group Leader, and 30.0% believed they will be in the same position as now.

For the Focus Groups, 11 team members (supervised by the PI volunteers) from the same 4 Institutes were interviewed, 45.4% were Master students, 27.3% were PhD students and another 27.3% were Researchers (have finished their Master's degree and didn't enroll on a PhD programme). Regarding the number of research groups they have been part of, 27.3% only

have been in one, 36.4% have been in 2 groups, and 36.4% in 3 or more groups so far. Concerning the gender and age, the majority were female (81.8%), and the ages ranged from 22 to 35 ($m = 25.3$, $sd = 3.4$).

Regarding the surveys, 28 PIs from 6 different Institutes, mostly from iMM and ITQB (42.9% each) have participated and finished the questionnaires. 64.3% of participants were in a Post-Doc position, and the majority has been in Research for more than 10 years (82.1%) and were in the current position for 3-4 years (32.1%). The groups they were currently working in had between 1 to 20 team members ($m = 9.3$, $sd = 4.2$). All participants have been responsible for supervising other group members, ranging from 1 to 20 people supervised in total so far, and most of them have been supervising other members for more than 5 years (71,5%). In terms of career expectations, most of the participants would like to become a Group Leader (39.2%), were open to it, depending on the circumstances (25.0%) or were not sure yet (17.9%). Only 17.9% claimed that do not want to become a Group Leader. The participants were from 5 different nationalities, being Portuguese the most prevalent (75.0%). Concerning gender and age, 57.1% were females and ages ranged from 27 to 53 ($m = 40.2$, $sd = 5.8$) (Appendix II).

Although a questionnaire was built for team members, the number of respondents was not enough for a reliable statistical analysis ($N=6$).

3.3. Instruments

For data collection, a multi-method approach was used, taking advantage of both qualitative and quantitative data. This method is useful to evaluate different aspects of leadership in this particular research environment: on the one hand, the qualitative approach will provide insights of individual perceptions and experiences, giving access to local knowledge, on the other hand, the quantitative approach will allow to discern biases arising from social desirability, help to corroborate findings from the qualitative study and enable to measure the impact of the intervention later on (Kelle, 2006).

3.3.1. Individual interviews

The individual interviews for PIs were semi-structured, since there was a pre-established script (see Appendix III) but it was possible to modify the style, pace and ordering of questions to evoke the fullest responses from the interviewees (Qu & Dumay, 2011). The interviews were structured according to three main areas: personal experience (e.g., where they work, how long have they been a PI, how many people are supervising); leadership skills (e.g., what were their strengths as leaders, what could be improved, what is a good leader), and training (e.g., if they

ever participated in any leadership training, and what would be interesting to be addressed in a leadership training).

3.3.2. Focus Groups

As for the individual interviews, also the Focus Groups interviews for team members were semi-structured, with a base script (see Appendix IV). This script was structured in four parts: the first part was for participants to present themselves and to function as an ice breaker; the second was for them to talk about their personal experiences with their supervisors; the third was focused on supervisors leadership skills (e.g., what they think a good supervisor should have and why, what they need to develop); and the fourth part was to discuss the possibility of leadership training for PIs (e.g., its importance, how could they benefit from it).

3.3.3 Questionnaires

Questionnaires were built on Qualtrics XM survey platform. Two different surveys were created, one for leaders (Appendix V) and another one for group members (Appendix VI), both containing items to evaluate perceptions on Leadership functions. The main difference was the way sentences were formulated (for leaders, sentences were written in the first person singular, i.e., “I...”; while for group members questions referred to their supervisors, i.e., “My supervisor...”).

Leadership functions were measured using the Team Leadership Questionnaire (Morgeson et al., 2010). To evaluate Transition phase tasks, five functions were used: Establish expectations and goals (e.g., “*Set or help set challenging and realistic goals*”. $\alpha = .715$), Train and develop team (e.g., “*Help new team members learn how to do the work*”. $\alpha = .786$), Provide feedback (e.g., “*Review relevant performance results with the team*”. $\alpha = .716$), Define mission (e.g., “*Ensure the team has a clear direction*”. $\alpha = .835$), and Structure and plan (e.g., “*Define and structure my work and the work of the team*”. $\alpha = .494$). For the Action phase, six functions were evaluated: Solve problems (e.g., “*Implement or helps the team implement solutions to problems*”. $\alpha = .855$), Encourage team self-management (e.g., “*Encourage the team to make most of its own work-related decisions*”. $\alpha = .783$), Support social climate (e.g., “*Respond promptly to team member needs or concerns*”. $\alpha = .846$), Monitor team (e.g., “*Monitor team and team member performance*”. $\alpha = .597$), Challenge team (e.g., “*Emphasize the importance and value of questioning team members*”. $\alpha = .424$), and Perform team task (e.g., “*Will work along with the team to get its work done*”. $\alpha = .771$). Two other functions from each phase were excluded to reduce survey length: Compose team and Sensemaking, from the Transition Phase,

and Manage team boundaries and Provide resources, from the Action phase. The exclusion criteria were functions that in principle are not sole responsibility of PIs, but also of Group Leaders. For each function, three constructs were used, where participants were asked to rate, on a 7-point scale, their level of agreement (1- Strongly disagree; 2- Disagree; 3- Somewhat disagree; 4- Neither agree or disagree; 5- Somewhat agree; 6- Agree; 7- Strongly agree).

In another section, participants were asked to rank all the functions from 1 (the most relevant) to 15 (the less relevant). This exercise gives an idea of which functions are most valued by the participants.

For team members only, another section was included to measure *Work engagement*, *Team viability* and *Turnover intention*.

Work engagement was measured using the Engagement scale from Schaufeli and colleagues (2002). Three items were used to measure each factor structure of engagement: Vigor (e.g., “*At my work, I feel that I am bursting with energy*”), Dedication (e.g., “*I am proud of the work that I do*”), and Absorption (e.g., “*I am immersed in my work*”), also using the same 7-point scale for the level of agreement.

Team viability was based on the work of Tekleab and colleagues (2009), using also 3 items (e.g., “*This team should not continue to function as a team*”), evaluated on the same 7-point scale for the level of agreement

Turnover intention was measured using the Staying or Leaving Index (Bluedorn, 1982), which asked respondents to rate their chances of still working at the lab three, six months, one or three years from now, on a 5-point scale (1- Chances are very small; 2- Chances are small; 3- Chances are even; 4- Chances are big; 5- Chances are very big).

Both questionnaires also included a Sociodemographic section, asking for the Place of work (*Research Institute*), Position (*Group Leader, Post-doc, PhD student, Master student, Research fellow, Technician, Other*), Tenure (*for how long they have been in that position*, with the options: *Less than 1 year, 1-2 years, 3-4 years, 5-6 years, 7-8 years, 9-10 years, More than 10 years*), Age and Gender. For group members, it was also asked the number of direct supervisors so far. For leaders, it was asked for the team dimension, number of projects, scientific production (e.g., number of scientific publications), number of team members they supervised and future perspectives (i.e., if they would like to become group leaders).

Regarding the questionnaires, it's important to keep two considerations in mind. Firstly, a Cronbach's alpha below 0.70 indicates questionable reliability but can still be accepted (Ursachi et al., 2015). Secondly, while the number of team members who participated in the

questionnaire was not sufficient for a reliable statistical analysis, the instrument has been developed and is presented for future reference.

3.4. Data analysis

Both Interviews and Focus Groups were used for a qualitative analysis. All conversations were transcribed in full (986 minutes in total), and a thematic analysis was performed using MaxQDA 10 Software. For both Interviews and Focus Groups, the Template Analysis method was used to perform a thematic analysis to the collected data (King, 2014). A hierarchical coding structure was developed (Brooks et al., 2015), summarizing all the relevant topics addressed and dividing them into three levels, starting from more general themes to more specific ones. The first level was defined *a priori*, as the general themes were the ones expected from following a semi-structured interview. The topics for the next levels were both defined *a priori*, as some of them were expected to be relevant to the analysis (e.g., leadership tasks from the work of Morgeson et al., 2010), and also *a posteriori*, according to the topics that were raised by the interviewees. By the end, the templates were slightly different for the individual interviews and Focus Groups, as some of the topics raised were not coincident, although, both will be compared in the Results chapter. The full template analysis can be found in Appendix VII.

The Surveys, on the other hand, were used to perform a quantitative analysis. After collecting all the answers, data was exported to the IBM SPSS Statistics 27 software for statistical analysis. After the scale reliability was analyzed and accepted for each variable, a new single variable was created to represent each dimension, by calculating the average value of all the items that composed that dimension. Then Descriptive statistics were performed to numerical variables to get the Average, Standard deviation, Minimum and Maximum values. For some Sociodemographic variables, the categorical ones (Institution, Position, Tenure and Gender), frequency analysis was performed instead. Finally, a Correlation matrix was also generated in order to understand which variables could be correlated. Pearson correlation coefficient was used for numerical variables and Spearman correlation coefficient for categorical variables.

CHAPTER 4

Results

In this section, the results of this study will be presented and discussed in detail. This will involve a comprehensive analysis of the collected data, which will provide support for the selection of topics to be included in the proposed intervention. The numbers presented between brackets refer to the number of different participants mentioning the topic (not the number of times the topic is mentioned).

4.1 Interviews and Focus Groups

4.1.1. Principal Investigators

At the beginning of each interview, PIs were asked about what motivated them to participate in this study, and there are two main reasons: to improve their team management skills [6] and to contribute with their knowledge or have an impact [7].

In the first part of the interview, PIs were invited to talk about their *personal experience* managing a team. They mention some of the leadership tasks they usually implement [4], which were more focused on leadership behaviors from the Action Phase [4] (i.e., tasks related to performing work activities that directly contribute to goal accomplishment), such as Encourage team self-management [2] (e.g., “*My attempt is always for people to become more and more autonomous, both in the design and in the interpretation of the results*” - Leader 8), Support social climate [2] or Solve problems [1]. From the Transition Phase, a few also mentioned to Train and develop their teams [2] and to Establish expectations and goals [1]. They also talked about their intrinsic motivation [4], for example, the fact that they enjoy teaching [3] (e.g., “*I really like the process of trying to teach someone something, in the sense that when the person is younger, for example*” – Leader 8), and also mention their concerns regarding managing a team [5]. In that regard, they mention leadership tasks from both the Transition Phase [3], such as Structure and Plan [2], Provide feedback [1] and Train and develop the team [1], and from the Action phase [3], such as Monitor Team [2], Provide resources [1] and Encourage team self-management [1]. Apart from the leadership skills, they also mention some concerns regarding their Personal skills, namely Time management [3] (e.g., “*(...) I feel that sometimes I'm just working for others (...), and I'm not investing that much in what really interests me at the moment. (...) I feel the need to sometimes have time for myself, because the PI's work is a lot to give, and that's one of the hardest parts.*” – Leader 5), and also about their Interpersonal skills [4], such as how to adapt their leadership style to each member, with the most mentions

[3] (e.g., *“it can be difficult, (...) you almost need a degree in psychology to figure out that student A needs something different from student B”* – Leader 10), followed by Establish good interactions [1] and Conflict management [1]. Concerning their opinion on how the team sees them, they mention mostly positive characteristics (16 different ones), being Present the most mentioned [4], followed by Supportive [2], Concerned [2] and Good supervisor [2]. Only 3 participants referred to some negative characteristics as well, with greater emphasis on Lack of self-confidence [3], and Lack of focus [2].

Another big theme that was addressed in the interviews was regarding *Leadership skills*. When asked about what the PI’s main tasks are (where the main goal was to gather information about specific tasks and responsibilities of this particular job role), some participants [6] referred to Human Resources Management tasks, mentioning the importance of Managing a group of people [4] (e.g., *“I think it’s also important to know how to manage people, I think it’s one of the biggest difficulties we have.”* – Leader 3), and also to provide Career guidance to their team [2]. Then, most participants [8] also mentioned specific leadership tasks, both from the Transition phase [6] and the Action phase [6], which means they recognize the relevance of their role on both phases. From the Transition phase, Train and develop team was the most mentioned task [4] (e.g., *“Try to provide the best training possible to the student, (...) trying to train him the best way, not only on scientific content but also on ethics, scientific work and so on.”* - Leader 8), followed by Structure and plan [2], Define mission [2] and Establish expectations and goals [1]. From the Action phase, the most mentioned task was to Support social climate, with 4 participants raising that subject (e.g., *“A PI is someone who should want (...) a team to work well, all people must be well, if people are not feeling well the PI can make itself available for the person to talk, to share what is going on (...), has to be receptive.”* – Leader 1), followed by Monitor team [3], Perform team task [2], Encourage team self-management [1], Provide resources [1] and Solve problems [1]. Finally, all PIs also provided examples of specific tasks from their job that are not directly related to leadership or team management [10], such as Grant writing [7] (e.g., *“In a non-funding cycle, a PI’s main task is to seek for funding, is to write projects(...)”* – Leader 4) or Project management [5] (e.g., *“I had to keep in mind the grant as it was written (...), what I claimed I was going to do, you have to meet the requirements of this grant, (...) so that’s part of it.”* – Leader 10). Although these tasks seem to be important for the leaders, they are not the focus of this study and, therefore, will not be considered for the intervention.

In this section, participants were also asked about what they consider a good leader to be (which provides information about their expectations or ambitions) and about their Strengths as leaders (to understand what competencies they recognize in themselves).

When picturing a good leader, 4 big groups of skills are raised: 1) Leadership skills [9], including 5 tasks from the Transition phase mentioned by 6 participants (Define mission, Establish expectations and goals, Structure and plan, Monitor team and Train and develop team), and 5 tasks from the Action phase mentioned by 5 participants (Encourage team self-management, Manage team boundaries, Performs team task, Provide feedback and Support social climate); 2) Interpersonal processes [10], such as Motivate the team [4] (e.g., *“I think a good leader in Science has to keep the student excited.”* – Leader 9), Adapt style to people [3] (e.g., *“I have to understand that a student can be more sensitive than another and that I have to speak to one in a slightly different way”* – Leader 7), Open communication with the team [3] (e.g., *“A good leader is a person (...) who listens to the other and gives him the opportunity to share his idea, however messed up or outdated it may be, giving him the opportunity [to be listened].”* – Leader 5), and Conflict management [1]; 3) Personal skills [6], where several competencies or characteristics were mentioned, such as Time management [2], Humanity [2], Creativity [1], Passion [1], Patience [1], Focus [1], Comprehensiveness [1], Respect [1], Being present [1] and Open minded [1]; and 4) PI specific tasks (tasks that are specific for their role), with 6 people mentioning them, being Keep up with the literature the most mentioned [3], followed by Grant writing [2], Funding management [1], Project management [1] and Networking [1]. In this question, 3 participants also mention the importance of providing Career guidance to their team members (e.g., *“(...) but I think that a good leader has the obligation to advise its students with their professional decisions.”* – Leader 9).

Regarding their Strengths, 6 participants consider to be good performing at least some of the 4 Leadership tasks mentioned, 2 from the Transition phase (Structure and plan, and Train and develop team), and 2 from the Action phase (Encourage team self-management and Support social climate), being the most mentioned Support social climate [4] (e.g., *“I think I can create a good empathy with people, I think that’s important. I think I have a great concern with people (...)”* – Leader 3). Apart from the Leadership tasks, 5 participants also consider having Interpersonal skills, such as the capacity to Lead by example [3] (e.g., *“I think it’s really leading by example, I like to do that”* – Leader 2), to Communicate [3], to Motivate people [3] and to promote Team work [1], and 8 of them consider to have some Personal skills as well, such as Availability [4] (e.g., *“I am very accessible, I put myself on an equal level”* – Leader 5), Passion

[3], Auto-efficacy [1], Creativity [1], Sincerity [1], Patience [1] and Flexibility [1]. Finally, only a minority consider to be good with a specific PI task: Grant writing [2].

On another side, PIs were also asked about what they believe they could still improve as leaders (which will provide an idea of skills they would be willing to develop) and what they think is lacking in most PIs nowadays (which would give an idea of skills they believe would be useful for their profession, by excluding the social desirability factor, since they can be excluding themselves from this appreciation).

When asked about the skills they would like to develop as leaders, only 2 Leadership tasks were mentioned: Manage team boundaries [2] (from the Action phase, e.g., *“In order for me to be able to lead my team as well, I also have to be able to deal better with the leadership above me, and sometimes that's also a little bit difficult”* – Leader 2), and Structure and plan [1] (from the Transition phase, e.g., *“(…) and management of… what needs to be done, above all, because I like questions, and I really enjoy looking for answers, and I easily get dispersed doing parallel things that give me more pleasure than managing goals, I really have problems with managing goals”* – Leader 4). Most of the PIs have referred to Personal skills [7], being Time management the main one, mentioned by 4 participants (e.g., *“(…) and also time management, because this is another thing that is very important”* – Leader 1), followed by Auto-efficacy [2], Assertiveness [1], Organization [1] and Planning [1]. As for Interpersonal skills, mentioned by 5 participants, Conflict management is the most referred [3] (e.g., *“I really think it's at the level of conflict resolution. I think it's a component that fails a bit, also among my peers, not only between me and my team (…).”* – Leader 2), followed by Motivate people [1]. Finally, 4 PIs have also indicated some Specific PI functions, such as Funding management [2], Grant writing [1], Public presentations [1], and Keep up with the literature [1].

Regarding their opinions on what is lacking in most PIs with respect with their leadership competencies, 7 of the participants mention Leadership skills, including 4 tasks from the Transition phase [5] and 2 tasks from the Action phase [3], revealing that they feel most PIs struggle more with evaluating and planning activities to achieve the team's goals. From the Transition phase, the most referred task is Establish expectations and goals [3] (e.g., *“The goals are not very well defined, I think they could be better defined (…).”* – Leader 9), followed by Compose team [1], Define mission [1], and Structure and Plan [1]. From the Action phase, the tasks mentioned are Support social climate [2] and Encourage Team self-management [2]. Also, 7 of them referred to Personal skills, being Empathy the most mentioned one [4], followed by Humanity [3], Passion [2], Flexibility [2], Assertiveness [1] and Organization [1]. Interpersonal skills were also defined, by 5 participants, as something that most PIs were lacking (e.g.,

“*Certainly in Science, in general, is people skills, interpersonal skills. Scientists are notoriously bad.*” – Leader 10), including also Conflict management [1]. Finally, 2 PIs have mentioned specific PI tasks, such as Funding management [1] and Meetings management [1].

By comparing all these groups of answers (what is a good leader, their strengths, and competencies to develop or lacking), it is possible to infer if they believe they have met, or not, their expectations (i.e., if they consider they are already good leaders). From the 15 competencies mentioned when describing a good leader, 6 of them were also mentioned when considering their strengths (Structure and plan, Train and develop, Encourage team self-management, Support social climate, and Motivate the team, and Communication with the team), and 9 of them were mentioned when describing competencies to develop or lacking (Define mission, Establish expectations and goals, Structure and plan, Train and develop, Manage team boundaries, Encourage team self-management, Support social climate, Conflict management and Motivate the team), having 4 competencies mentioned as Strengths and as important to develop as well.

In order to understand their view on what the current status of the relationships between PIs and their team members was, i.e., if they were mostly positive or negative, they were asked to describe those relationships. Most of them reported that these relationships are heterogeneous [6], referring both to Positive aspects [10] and Negative aspects [9]. From the Positive aspects, the most mentioned are Personal skills [7], namely Friendship [6] and Flexibility [1]. Then, 6 PIs also referred to Leadership skills involved in most relationships they observed, mentioning 2 tasks from the Transition phase (Train and develop the team, and Provide feedback), and 3 tasks from the Action phase (Encourage team self-management, Support social climate and Perform team task). Finally, as a positive aspect, 5 PIs also pointed out Personal skills, such as Communication [3] (e.g., “*I consider positive... normally the doors of the supervisors are open, of their offices, and the person can always come in and can always talk*” – Leader 6), Adaptation of style to people [2] and Teamwork [2]. As negative observations, PIs pointed behaviors like Authoritarianism [5] (e.g., “*But I also have the example of relationships where there is a bit of power there, of someone who thinks it’s a bit superior to the students and who exercises that power*” – Leader 1), Lack of communication [5] (e.g., “*It is very important to know how to communicate, the PI with the people he works with and vice versa, and this does not always happen*” - Leader 5), Bad environment [3], Lack of guidance [3] and Lack of ethical knowledge [1].

The third part of the interview was more focused on the *Leadership training*, where PIs were asked about the themes they thought would be relevant to be addressed on that training.

Once again, 4 big areas were raised: Leadership skills, Interpersonal skills, Personal skills, and Specific tasks for their job role. Regarding the Leadership skills, most PIs mentioned tasks from the Transition phase [6], and only 1 of the participants referred to tasks from the Action phase (Perform team task, Solve problems and Support social climate). From the Transition phase, the most mentioned task was to Establish expectations and goals [3] (e.g., “*A module on how to have the ethical values very explicit right from the start in your team, (...) how to inform my group, or how to transmit my ethical values to my group*” – Leader 5), followed by Provide feedback [1], Define mission [1], and Train and develop the team [1].

In respect to Interpersonal processes, the most raised topics (with 4 different participants mentioning them both) were how to Motivate the team (e.g., “*You gotta be able to keep the enthusiasm and willing to work (...), you gotta be able to inspire your team, because if we got a bunch of inspired people, it doesn't matter what happens, they still want to succeed.*” – Leader 10) and how to Adapt the style to people (e.g., “*I had a similar approach in terms of leadership [with 2 different people] but they were actually very different people in terms of personality and way of being, so maybe I would have benefited from a slightly different approach*” – Leader 8), followed by Conflict Management [3] (e.g., “*Conflict management, which I mentioned earlier and which is always complicated...*” – Leader 2) and Communication [2]. Regarding Personal skills, the topic that was most talked about was Time management, with 4 mentions (e.g., “*I think it is essential to address time management because we have so much work...*” – Leader 5), followed by work on Personal development [1]. Finally, some Specific PI tasks were also pointed out as important to be addressed, such as Project management [2], Manage financial resources [1], Get funding [1], and Meetings management [1], and although this is not the scope of the project, there were 70% of the participants mentioning them. Other suggested topics to be addressed were regarding Ethics in Science and providing theoretical knowledge about the most appropriate leadership behaviors.

After highlighting the themes that they believed should be included in the training, participants were asked if there was any subject that would be useless to address, and the majority (7 of them) answered that “*nothing is completely useless to be addressed*”, explaining that “*everything has its uses, it can be more or less useful, it will depend from person to person*” (Leader 4), and even if the theme is not new to someone “*it's always good to have a refresher of information*” (Leader 1) because “*it can surprise us*” (Leader 2). However, a few participants have mentioned some situations or themes that they believe wouldn't be helpful, such as comparing a Research team to a Company [1] “*because it's different, and making these parallels is useless because they don't help Science.*” (Leader 5) or Providing specific rules [1]

“that have to do with more tactical things, like schedules” (Leader 9). Only 1 of the participants mentioned that what “would be totally useless (...) is that thing of Emotional Intelligence” (Leader 6). Finally, when asked about disadvantages that, in their perception, could arise from this type of training, most of the PIs claimed that they don’t see any [7], if “adjusted to the different realities” (Leader 6) and “if not imposed” (Leader 9). On this subject, it is important to mention that 70% of the participants have never attended a Leadership training before, and only 30% have attended at least one before.

4.1.2. Team Members

In the focus groups with team members, 3 general themes were addressed: Personal experiences with their supervisors, Supervisor’s leadership skills, and Leadership training for PIs.

When asked about their *personal experiences* with their supervisors, all team members mentioned some of the leadership skills their supervisors usually implement, including 5 tasks from the Transition phase and 5 tasks from the Action phase. From the Transition phase, the most referred tasks were Structure and plan [4] (e.g., “I had to have everything programmed to the millimeter for 3 or 4 weeks ahead, and that made it possible to have a perspective of what is possible to do in the time we have” - Team member 11) and Train and develop team [4] (e.g., “They even encouraged me to go to conferences, to even go abroad” - Team member 2), followed by Provide feedback [1], Define mission [1], and Establish expectations and goals [1]. From the Action phase, the most mentioned task was Encourage team self-management [7] (e.g., “As I began to understand how the protocols worked, she gave me more autonomy” - Team member 4), followed by Monitor team [4] (e.g., “One of them is always on top, she knows everything I have, everything right, she knows my thesis from top to bottom” - Team member 8), Solve problems [2] and Support social climate [1]. The groups also mentioned some behaviors they considered to be positive, such as their supervisors’ Availability [7] (e.g., “Both were very patient, available... I think this is a very important characteristic, to be available (...)” - Team member 5), and the close relationship they developed [3] (e.g., “I think we have an excellent relationship, I think we work very well together” - Team member 7), as well as some behaviors they considered to be more negative, such as not giving Autonomy [3] (e.g., “I had too much follow-up and that also slowed me down a bit to develop my autonomy” - Team member 2), being a bit Possessive [2] (e.g., “I have no better word than possessive. (...) I wanted to help other people in the laboratory, (...) and a line was defined for me right there, which is “if she is under my guidance, she doesn't help anyone else”...” - Team member 5), and having few Experience [2]. On the negative side, 4 team members also mentioned the Lack of guidance,

although they were referring to the Group Leader (in previous work experiences, where the GL was their supervisor), so it will not be considered for this study.

When team members were asked to characterize their supervisors, the majority reported several of their qualities [10], with the most mentioned one being Availability [10], followed by Attentiveness [3], Commitment [3], Focus [2] and Good teacher [2], among others. Only 3 participants reported aspects they didn't appreciate as much, such as being too optimistic [2], a bit demanding [2] or lacking assertiveness [1].

The second theme that was addressed in the focus groups was regarding *Leadership skills* of supervisors.

When asked about what a good supervisor should be or do, most team members mentioned Leadership tasks [8], but also some Interpersonal skills [4] and Personal skills [5]. For the Leadership they referred 2 tasks from the Transition phase, namely Provide feedback [2] and Train and develop the team [2] (e.g., “(...) *getting the perception, over time, of what the student is capable of and what the student is worth in terms of researcher, and push for these characteristics.*” – Team member 11), and 3 tasks from the Action phase, such as Encourage team self-management [3] (e.g., “*They also allowed me to be quite autonomous and (...) I think this is a very important feature for a PI.*” – Team member 5), Support social climate [1] and Solve problems [1]. As Interpersonal skills, participants mentioned Motivate the team [2], Communication with the team [2] and Adapt style to people [2]. Finally, as Personal skills the most mentioned were Knowledge [2], Confidence [2] and Patience [2], followed by Openness [1], Availability [1] and Rigor [1].

Concerning their opinions on what is lacking in most PIs with respect to their leadership competencies, 9 of the team members mentioned Leadership skills, 5 mentioned Personal skills and 1 mentioned Interpersonal skills. Regarding Leadership skills, 3 tasks from the Transition phase were mentioned, being Train and develop team the most referred [4] (e.g., “*It's easier, it's easier to do it himself [the supervisor] than to teach it, it's faster.*” – Team member 8), followed by Establish expectations and goals [2] and Structure and plan [1], and 2 tasks from the Action phase, being Encourage team self-management the most mentioned one [4] (e.g., “*[The supervisor] must be able to guide him [the student] and not sending him to do things, because the person has to discover some things for himself and not basically being told everything, because otherwise I think that, instead of guiding, the supervisor is basically just taking the student and sending him to the place he wants.*” – Team member 1), followed by Solve problems [1]. This is in line with the answer about what team members think their supervisors still need to develop, where Train and develop team [3] was the only tasked

mentioned (e.g., *“I think it’s important to change the point of view, instead of seeing the student as a workforce, seeing the student as an opportunity to teach someone”* - Team member 1), however, it should be noted that this question was only asked in one of the focus groups. For the Personal skills, 2 participants referred to Assertiveness and Availability, and only 1 referred to Empathy. Finally, with respect to Interpersonal skills, Communication [1] and Solve conflicts [1] were mentioned, although by a small minority.

The third main theme of the Focus groups was the *Leadership training*. When asked about general ideas about Leaders having a Leadership training, most of the team members recognized the importance of having such training [8], because *“not everyone is good dealing with people”* and *“as much experience as they may have, it might be more effective if there was a program dedicated to it”* (Team member 2), and *“there is no training for that”* (Team member 11) or *“there is also not much dissemination of this type of help”* (Team member 2). Also, team members agreed that *“most people in science learn to mentor based on what someone has done with them”* (Team member 8) or *“it’s one of those things that we think we learn with experience too”* (Team member 5), highlighting that leaders should be open to listen to feedback on their leadership and to learn about this topic by their own initiative.

Regarding the Benefits from this training, team members believe it could improve not only their supervisors’ Leadership competencies [5], but also their Personal [3] and Interpersonal [2] skills. On Leadership, team members believe they could be better with Training and developing their team [4] (e.g., *“Maybe if we are taught in a more structured way, maybe we can, for example, learn much faster without always having new doubts (...) because we didn’t understand what he was trying to explain.”* – Team member 4), and Structuring and planning [1], both tasks from the Transition phase, and also Solving problems [2] and Encouraging the team self-management [1], tasks from the Action phase. Concerning to the Personal skills, team members suggest that possible benefits from the training could be increasing their Emotional Intelligence [2], improving their Self-Efficacy [1], and their Time management skills [1]. As for their Interpersonal skills, the training can help the leaders Adapting their style to people [2] and with their Conflict management skills [1]. It is important to mention that, on their perspective, both sides benefit with this training, since *“they learn how to supervise better and we are better supervised”* (Team member 5), but for that to work, the training should be *“more focused on science, because it is the area we are in”* (Team member 10).

Finally, when asked what themes they believed should be addressed on a Leadership training to their supervisors, team members referred to some Leadership competencies [6], Interpersonal [6] and Personal [2] skills, and also to some PI specific tasks [1]. Most of the

Leadership tasks reported are from the Transition phase [5], and include Structure and plan [3] (e.g., “*And also a planning module, for them to be able to organize their students’ thesis better*” – Team member 9), Train and develop [2] (e.g., “*Some foundations in pedagogy, given that leaders must have the ability to teach their mentees*” – Team member 1), and Establish expectations and goals [1]. Only 2 participants mentioned tasks from the Action phase, such as Solve problems [1], and Support social climate [1]. To develop their leaders’ Interpersonal skills, team members suggested to include themes concerning Adapt style to people [4], Conflict management [2], Motivate people [1] and Communication [1], and to improve Personal skills, only Time management was referred [1]. Finally, 1 team member also mentioned a couple of PI specific tasks leaders should improve: Writing projects and Manage financial resources.

4.1.3. Principal investigators and Team members

It is interesting to compare the different point of views, from supervisors and their team members, on leadership skills. When comparing the supervisor’s experiences managing a team, and the team’s experience with their supervisors, they are pretty aligned. This means all leadership tasks mentioned by the PIs were also mentioned by the team members (Table 1).

Table 1

Number of Supervisors and Team members mentioning topics related to their experiences

Topic	Supervisors <i>Experience managing a team</i>	Team members <i>Experience with supervisor</i>
Encourage team self-management	2	7
Solve problems	1	2
Support social climate	2	1
Monitor team	0	4
Challenge team	0	1
Establish expectations and goals	1	1
Train and develop	2	4
Provides feedback	0	1
Structure and plan	0	4
Define mission	0	1

Interestingly, many of the negative interactions reported by team members (e.g., lack of autonomy, too much micromanagement) also arise as concerns/struggles by their leaders (e.g., *Encourage team self-management*). On the same line, when team members are asked to characterize their supervisors, and supervisors are asked how they believe their team members would characterize them, they are also quite aligned (e.g., Available, Attentive, Committed VS Present, Supportive, Concerned; Good teacher VS Good supervisor; Lacking assertiveness VS Lack of self-confidence).

When asked about what a good leader is, leaders and team members agree on 8 out of the total 16 tasks and competencies mentioned (*Train and Develop, Provide feedback, Solve problems, Encourage team self-management, Support social climate, Motivate the team, Adapt style to people and Communication with the team*; Table 2).

Table 2

Number of Supervisors and Team members mentioning tasks performed by good leaders

Leadership tasks	Good Leader	
	Supervisors	Team members
Compose team	0	0
Define mission	2	0
Establish expectations and goals	2	0
Structure and plan	2	0
Train and develop	1	2
Provide feedback	1	2
Monitor team	1	0
Manage team boundaries	1	0
Perform team task	1	0
Solve problems	1	1
Encourage team self-management	1	3
Support social climate	2	1
Conflict management	1	0
Motivate the team	4	2
Adapt style to people	3	2
Career guidance	3	0
Communication with the team	3	2

On the other hand, when asked about the general competencies to be developed by PIs, they agree on 4 out of the 10 competencies and tasks mentioned (*Establish expectations and goals, Structure and plan, Encourage team self-management and Conflict management*; Table 3).

Table 3

Number of Supervisors and Team members mentioning general competencies to be developed by PIs

Leadership tasks	General competencies to develop	
	Supervisors	Team members
Compose team	1	0
Define mission	1	0
Establish expectations and goals	3	2
Structure and plan	1	1
Train and develop	0	4
Solve problems	0	1
Encourage team self-management	2	4
Support social climate	2	0
Conflict management	1	1
Communication with the team	0	1

Regarding the themes they believe should be addressed on a Leadership training, out of the 12 competencies mentioned in total, 8 of them are in common for leaders and team members (*Establish goals and expectations, Train and develop, Solve problems, Support social climate, Conflict management, Motivate the team, Adapt style to people and Communication with the team*) (Table 4).

Table 4

Number of Supervisors and Team members mentioning topics to be addressed in a leadership training for PIs

Leadership tasks	Themes to address in a leadership training	
	Supervisors	Team members
Define mission	1	0
Establish expectations and goals	3	1
Structure and plan	0	3
Train and develop	1	2
Provide feedback	1	0
Perform team task	1	0
Solve problems	1	1
Support social climate	1	1
Conflict management	3	2
Motivate the team	4	1
Adapt style to people	4	4
Communication with the team	1	1

4.2. Questionnaires

4.2.1. Principal Investigators

As mentioned before, 28 PIs have participated and finished the questionnaires. Regarding their self-evaluation on the different Leadership tasks, the lowest average score was 5,37 (SD=0.86), corresponding to *Perform team tasks*, and the highest average score was 6,08 (SD=0.81), corresponding to *Define mission*. This means that, in general, supervisors tend to Agree that usually they perform all Leadership tasks (Table 5).

Table 5

Means, standard deviations, Maximum and Minimum values regarding Leadership tasks

Leadership tasks	Average	Std dv	Min	Max
Transition phase				
Establish expectations and goals	5,73	0,87	2,67	7,00
Train and develop	5,81	0,98	2,00	7,00
Provide feedback	5,92	0,88	3,67	7,00
Structure and plan	5,95	0,64	4,33	7,00
Define mission	6,08	0,81	3,33	7,00
Action phase				
Performs team task	5,37	0,86	3,00	7,00
Monitor team	5,46	0,85	3,33	7,00
Encourage team self-management	5,52	0,90	2,33	7,00
Support social climate	5,82	1,11	2,00	7,00
Solve problems	5,84	1,00	2,00	7,00
Challenge team	5,97	0,62	4,33	7,00

When they were asked to rank all Leadership tasks (from 1, the most relevant, to 15, the less relevant) there is no clear consensus, since standard deviations are big (the highest reaches 4.94). This can be explained by the fact that different people may value different things, and different projects may also require different tasks. Still, on average, the task that was considered less relevant was *Perform team task* (M=14.03; SD=1.59), and the most relevant was *Define mission* (M=3.32; SD=2.56). This means they believe the most relevant task is also the one they perform the most, and the less relevant is the one they perform less (Table 6).

Table 6

Means, standard deviations, Maximum and Minimum values when ranking Leadership tasks

Leadership tasks	Average	Std dv	Min	Max
Define mission	3,32	2,56	1,00	13,00
Establish expectations and goals	4,94	2,82	2,00	13,00
Train and develop team	5,41	2,99	1,00	12,00
Compose team	5,68	4,94	1,00	15,00
Structure and plan	5,76	4,03	1,00	15,00
Provide resources	5,79	3,65	1,00	14,00
Provide feedback	6,94	2,95	2,00	15,00
Solve problems	8,18	3,43	1,00	15,00
Encourage team self-management	8,44	3,42	1,00	14,00
Challenge team	9,06	3,32	2,00	15,00
Monitor team	9,82	3,25	2,00	15,00
Support social climate	10,68	3,84	1,00	15,00
Sensemaking	10,97	2,78	3,00	15,00
Manage boundaries	10,97	2,92	1,00	15,00
Perform team task	14,03	1,59	8,00	15,00

When looking into the Correlations matrix (Appendix VIII), it is possible to see that several Leadership tasks correlate with each other. It is interesting to notice that *Establish expectations and goals* and *Train and develop team* show the greatest number of significant correlations with other Leadership tasks (60% each). *Establish expectations and goals* correlates significantly, at the 0.01 level with *Train and develop team*, *Provide feedback*, *Solve problems* ($p=.000$) and *Support social climate* ($p=.001$), and at the 0.05 level with *Define mission* ($p=.371$) and *Encourage team self-management* ($p=.359$). As for *Train and develop team*, a significant correlation can be observed, at the 0.01 level, with *Establish expectations and goals*, *Provide feedback*, *Solve problems*, *Support social climate* ($p=.000$) and *Encourage team self-management* ($p=.001$), and at the 0.05 level with *Define mission* ($p=.342$).

4.3. Discussion

In order to plan the most appropriate training, it is important to consider all data. During the interviews, when participants were asked about leadership skills in the different sections, several themes were raised, including some specific PI tasks or personal skills. This suggests that PIs may be more accustomed or inclined to think about their technical skills, which are considered the most relevant skills in the evaluation system of their professional class, rather

than their leadership skills. Actually, referencing one of the participants, “*many times people get to be lab leaders because they are very focused on results, very competitive, and doing things fast, (...) and they get there without having a good preparation for dealing with people and being able to manage people*” (Leader 3). Therefore, it is important to provide them with resources so that they can improve their interpersonal and leadership skills. For the purpose of this project, only skills related to leadership will be considered.

In order to understand which Leadership skills are more relevant to address, a summary table was built (Table 7) with all themes raised by leaders and team members in the different sections of the interviews: Desired competencies for a leader (extracted from “what is a good leader/supervisor?”), Shown competencies (extracted from “main strengths as a leader” and “experience with supervisor”), Competencies lacking (from “skills to develop as a leader” and “what is missing the most [in their supervisors]”), General competencies to develop (extracted from “what competencies are lacking in most PIs”), and Themes to address (extracted from “what themes would you address in a training session”). After summing the number of times a skill was mentioned in the “Competencies lacking”, “General competencies to develop” and “Themes to address”, skills were ranked from the ones that were most mentioned to the least mentioned. It was only considered the first 4 highest values (10, 9, 8 and 6), since the others are low (≤ 4). This provided 7 main competencies that need more attention: *Train and develop team*, *Conflict management*, *Establish expectations and goals*, *Adapt style to people*, *Structure and plan*, *Motivate the team* and *Encourage team self-management*. These are 7 priorities that are more focused on transition processes (3 tasks) and interpersonal processes (3 tasks). As an action process, there is only one task, *Encourage team self-management*, which to a certain extent can be considered a byproduct of the other processes, i.e., if activities are not well planned it is harder for the team to self-manage without needing external help. On the other hand, it is also hard to do it if the team is not motivated or engaged enough. Therefore, by working on the other 6 skills it is possible to improve this one as well as a result, and there is no need to work on this one directly.

It is interesting to notice that the functions that were initially excluded from the survey to reduce its length (*Compose team*, *Sensemaking*, *Manage team boundaries* and *Provide resources*) were indeed shown not to be so relevant for the target population of this project, as predicted, since two of them (*Sensemaking* and *Provide resources*) are not even mentioned in the summary table, and the other two have very few

mentions (Table 7).

When evaluating the results from the questionnaires, it is possible to rank the tasks that leaders feel they perform less. Starting by the lowest average score, the tasks are: *Perform team tasks*, *Monitor team*, *Encourage team self-management*, *Establish expectations and goals*, and *Train and develop the team*. However, it is important to consider that the differences in the scores are very small, and it is hard to establish a robust hierarchy. Besides, the scores are above the medium point of the scale, which means their self-evaluation on these leadership skills is still positive. Therefore, the training proposal will be mainly based on the more in-depth information collected in the interviews. Moreover, 3 of those skills were already considered, and the first 2 were not mentioned as important to develop in the interviews and are in the last positions of the importance ranking, therefore they will not be considered as targets for the intervention. Additionally, incorporating the tasks *Establish expectations and goals* and *Train and develop team* into the training proposal, as they have been found to be significantly correlated with several other leadership tasks, could potentially have a beneficial effect on other skills that are not directly included in the training (such as *Provide feedback*, *Solve problems*, *Support social climate* and *Define mission*).

In summary, the main functions that will be addressed in the training proposal are: *Establish expectations and goals*, *Structure and plan*, *Train and develop team*, *Motivate the team*, *Adapt style to people* and *Conflict management*, having also in mind *Encourage team self-management*.

Table 7

Summary table with the number of Supervisors and Team members mentioning all topics related to Leadership competencies

Leadership tasks	Desired competencies for a Leader		Shown competencies		Competencies lacking		General competencies to develop		Themes to address		Sum	Rank
	Supervisors	Team members	Supervisors	Team members	Supervisors	Team members	Supervisors	Team members	Supervisors	Team members		
Transition Phase												
Compose team	0	0	0	0	0	0	1	0	0	0	1	-
Define mission	2	0	0	1	0	0	1	0	1	0	2	-
Establish expectations and goals	2	0	0	1	0	0	3	2	3	1	9	2 nd
Structure and plan	2	0	1	4	1	0	1	1	0	3	6	4 th
Train and develop	1	2	1	4	0	3	0	4	1	2	10	1 st
Provide feedback	1	2	0	1	0	0	0	0	1	0	1	
Action Phase												
Monitor team	1	0	0	4	0	0	0	0	0	0	0	-
Manage team boundaries	1	0	0	0	2	0	0	0	0	0	2	-
Challenge team	0	0	0	1	0	0	0	0	0	0	0	-
Perform team task	1	0	0	0	0	0	0	0	1	0	1	-
Solve problems	1	1	0	2	0	0	0	1	1	1	3	-
Encourage team self-management	1	3	1	7	0	0	2	4	0	0	6	4 th
Support social climate	2	1	4	1	0	0	2	0	1	1	4	-
Interpersonal processes												
Conflict management	1	0	0	0	3	0	1	1	3	2	10	1 st
Motivate the team	4	2	3	0	1	0	0	0	4	1	6	4 th
Adapt style to people	3	2	0	0	0	0	0	0	4	4	8	3 rd
Career guidance	3	0	0	0	0	0	0	0	0	0	0	-
Communication with the team	3	2	3	0	0	0	0	1	1	1	3	-

CHAPTER 5

Intervention

In the following section, an intervention proposal focused on leadership training for Principal Investigators will be presented and discussed.

5.1 Intervention proposal

In alignment with the initial proposal of this project, and considering the results obtained, an intervention approach at the level of individual training was chosen.

The training program was designed to address the specific leadership skills gaps reported by the PIs and their teams, providing them with targeted development opportunities to enhance their leadership capabilities. The proposed title, “Elevate your Leadership: Essential Skills for Post-Docs”, was intentionally chosen to be more attractive than a straightforward one, potentially less interesting and inviting. Additionally, the title specifically mentions Post-docs instead of PIs, as they can more easily relate to this title, as in academia it is common to refer to Group leaders as PIs. Therefore, if the title were to say “Principal Investigator”, there would be a chance that Group leaders would attend and Post-docs would assume it is not meant for them.

The course is divided into four modules, totalizing 15 hours of training, each one focusing on specific aspects of leadership development, that will be discussed further. Each module is segmented in three phases: introduction, development, and conclusion. In the introduction, the sessions start with an ice breaker activity. The first module’s ice breaker is focused on helping participants get to know each other and feel more comfortable, while the ice breakers in the other modules are intended as a warm-up for the session. Then, after the ice breaker, the content and objectives of each module are presented, with the first module also introducing the program’s overall content and objectives in the first place. In the development phase, each module is designed to provide participants with a comprehensive understanding of different aspects of effective leadership.

Module 1 is designed to help participants understand the concept of leadership, and the role and importance of establishing expectations and goals for team members.

The module begins with a presentation on the definition of leadership, based on the Functional Leadership approach (Morgeson et al., 2010). The presentation is followed by a group discussion where participants explore the main tasks of leadership (ideally to recognize the ones they will be working on). Then, after a short coffee break, the idea is to focus on the

importance of being clear from the beginning, by establishing performance expectations and setting clear roles for team members. The presentation will also explore how this can impact team effectiveness, providing real-world examples to illustrate this point. Then, trainees will be introduced to a valuable tool: the Lab Manual. The Lab Manual serves as a guide to the laboratory's vision and operation, providing general expectations, guidelines, and useful information for all team members, and is intended to bring consistency and expectations to a common ground. This tool has been implemented successfully in several Research labs so far (e.g., Ritchey, 2020). In order to help participants to set clear and realistic goals, the SMART framework for goal-setting is then introduced (Locke & Latham, 1990). Finally, participants will have the opportunity to practice setting real SMART goals in small groups through a practical exercise.

Module 2 focuses on helping leaders structure and plan their own work and, consequently, their team members' work, as well as the importance of training and developing team members to enhance their skills and performance.

The session begins with a presentation on prioritization, planning, and scheduling, which are all essential components of effective time management. This is followed by a group discussion where attendees are invited to share or come up with tools that can be used to better manage their time. In this way, participants will have the opportunity to share their own preferred tools and learn about new ones from their peers. As a practical exercise, participants will then be provided with a worksheet to plan a task, share their plans with a partner, and receive feedback and suggestions. After a short coffee break, the importance of group meetings is explored, with an emphasis on how to set agendas, time limits, and foster a culture of learning and sharing knowledge. Participants will gain practical tips on how to facilitate effective group meetings that promote productivity and collaboration. The presentation then shifts to the presentation of one-on-one coaching as a tool to provide personalized support and guidance to individuals in order to improve their performance, achieve their goals, and develop their skills (Coutu & Kauffman, 2009). In this context, a brief mention of pragmatic communication is provided. After learning how to conduct effective one-on-one coaching sessions, participants will have the opportunity to role-play one-on-one scenarios in small groups. Finally, the session concludes with a presentation on the types of training (such as on-the-job training, classroom training, e-learning, coaching and mentoring), highlighting the benefits and limitations of each type.

Module 3 emphasizes the importance of motivation on work performance, the relevance of adapting leadership style to different personalities, and the value of encouraging team members

to take ownership of their work. This module helps leaders to create a positive and productive work environment and foster a culture of innovation and creativity.

The session starts with a debate on the different factors that affect motivation, including autonomy, recognition, feedback, and development opportunities. Participants will be encouraged to share their own experiences and insights on what motivates them and their teams. The module then progresses into motivation theories, specifically the Self-Determination Theory (Deci & Ryan, 2000), which provides a framework for understanding the underlying psychological needs that drive motivation (Autonomy, Competence, and Relatedness). A special attention will be given to the Autonomy component, in order to highlight the importance of encouraging team members to take ownership of their work. At this point, previous contents can be linked to this idea as well, for example, by emphasizing the importance of training and developing team members (Competence) or how each small goal is connected to a larger mission and explore how meaningful work can contribute to motivation. In the second part, after a coffee break, the importance of knowing the team members will be discussed, (their personalities, interests, career goals, work patterns, among other features). At this point, participants will be invited to take the DiSC assessment. The DiSC is based on a model that describes four main personality styles: Dominance (D), Influence (i), Steadiness (S) and Conscientiousness (C). This tool can help individuals better understand their own work style and how to deal with different personalities (Slowikowski, 2005). Starting from the analysis of their own profile, participants will learn how to adapt their leadership style to different personalities, using different leadership styles to meet different needs. The module concludes with motivation challenge, where participants will work in small groups to create a motivation plan for a fictional character based on its personality trait, and present their plan to the rest of the group. This will give participants the opportunity to apply the theories and concepts presented earlier in the session.

Module 4, the last one, aims to help participants understand the leader's role in conflict management and recognize the main tools to effectively manage and resolve conflicts within the team. This module helps leaders acknowledge the importance of fostering a culture of open communication, respect, and collaboration.

The module starts with a presentation about what is a Conflict, its sources and impacts (on motivation, productivity, and trust), followed by a group discussion about the role of a leader in managing conflicts. After the main theme is introduced, attendees proceed to a short coffee break. The second part of the session starts with an introduction to the five approaches of conflict management, including competing, collaborating, compromising, avoiding, and

accommodating (Rahim, 1983). This is followed by a case study featuring a conflict scenario, where participants will work in small groups to explore and compare the different approaches to resolve the same conflict (ideally 5 groups, as each group will have a different approach to explore). This exercise will help participants understand how different conflict resolution styles affect the outcome. After the case study, participants will be presented with some examples of common conflicts and suggestions on how to manage them based on the subjects previously learned. Finally, team-building activities will also be introduced as a way to promote communication, trust, and prevent conflicts (Bubshait & Farooq, 1999). The module ends with a team-building activity, not only to put the theory into practice but also to serve as a farewell activity for the end of the training.

All four modules conclude with a summary of the key take-home messages, followed by a question-and-answer session to address any remaining questions or concerns. Finally, a short assessment will be conducted to evaluate participants' learning and training effectiveness.

The detailed Pedagogical Intervention Proposal (PIP) can be found in Appendix IX and the detailed session plans for each Module on Appendix X.

5.2 Training evaluation

In addition to the training program itself, it is also important to evaluate its effectiveness. For this purpose, it will be considered the training evaluation model proposed by Kirkpatrick (1979). This model includes four levels of evaluation: reaction, learning, behavior, and results.

Reaction: This level measures how participants respond to the training program. It involves collecting feedback from participants on their experience of the training, such as how relevant and useful they found it.

Learning: This level measures whether the participants have acquired new knowledge, skills, or attitudes as a result of the training. It involves assessing the extent to which participants have achieved the learning objectives of the training program.

Behavior: This level measures whether participants have applied what they learned in the training program in their work environment. It involves assessing changes in behavior, such as changes in job performance, after the training.

Results: This level measures the impact of the training program on organizational goals. It involves assessing the tangible results of the training program, such as improved productivity, reduced costs, or increased revenue.

In this specific training program, the four evaluation levels will be addressed as follows:

At the end of each module, participants will be asked to complete a small feedback form to evaluate their reaction to the training (Reaction). The feedback form will include questions related to the quality of the content, the adequacy of the materials and methods, the usefulness of the training, the instructor's effectiveness, and the overall experience. At the same time, to measure if the information was effectively absorbed, participants will also be given a small test that will cover the key concepts and topics covered in the module (Learning). This will be a Criterial Evaluation, based on the degree of performance achieved by the trainees, the most appropriate evaluation method for trainings regulated by objectives. In the case of some practical contents, such as the group dynamics following the theoretical introductions, the evaluation will take place during the session itself, using observation sheets and/or evaluation sheets of practical work, with predefined criteria to ensure accurate and objective evaluation (more details on Appendix IX).

To evaluate the impact of the training on job performance (Behavior), participants will be given a survey 3-4 weeks after the training ends. The survey will ask questions about how the training has impacted their behavior, including a self-evaluation on their performance regarding the different leadership tasks, time management habits, motivation, conflict resolution skills, and their abilities to use the tools provided. This survey should also be taken before the training course starts so it is possible to compare the scores before and after the training and evaluate the impact of the training on their behavior.

Finally, to evaluate the overall effectiveness of the training program (Results), it is important to track metrics such as employee turnover (e.g., how many members left and joined the group), productivity (e.g., number of publications), efficiency (e.g., the number of students that graduated, how long a student takes to graduate) and employee satisfaction (e.g., satisfaction of team members with their supervisors, turnover intention) over a period of 6 months to 1 year after the training. Once again, this data should be collected also before the training starts, so the data can be compared to determine the extent of the training's impact on "business" results.

By evaluating training programs at each of these levels, it is possible to understand the effectiveness of the program and identify areas of improvement for future training sessions.

5.3 Relevance and Contribution

The "Elevate your Leadership: Essential Skills for Post-Docs" training program is designed to help Principal Investigators develop leadership skills that will enable them to lead high-performing teams. This program is relevant because Postdoctoral researchers often need to lead

small teams and may eventually aspire to become Group Leaders themselves, but they may not have received training in leadership skills. The program aims to fill this gap and equip Post-docs with the skills they need to effectively lead teams and achieve research goals. Besides, this training program was designed based on the needs and feedback of Post-docs and their team members, which makes it tailored to their specific needs. Additionally, the program offers several other benefits. Firstly, by equipping Post-docs with leadership skills, the program can improve the quality of research conducted by the team, as an effective leadership can facilitate communication, collaboration, and coordination among team members, leading to better research outcomes. It can also increase job satisfaction: managing teams effectively can create a positive work environment that can contribute to improve retention rates, which can be beneficial for the organization and research itself. Lastly, by evaluating the program effectiveness, it is possible to identify areas for improvement and redesign them accordingly.

In summary, this program can have a positive impact by enhancing the social and leadership competencies of Postdoctoral researchers. This is crucial for creating a culture of support and learning that ultimately encourages team members to stay and strive for excellence in their scientific work.

Finally, this project makes a valuable contribution to the literature on leadership development in scientific research teams. First, because there is a scarcity of literature that specifically addresses leadership in this context. Then, because this project has expanded the understanding of leadership functions within this context by incorporating topics that emerged *a posteriori*, from the feedback of supervisors and their team members. While the effectiveness of these topics has yet to be validated in further studies, this project represents a promising avenue for further research and development of leadership skills in scientific research teams.

5.4 Limitations and future improvements

In the course of this project, various challenges were encountered at different stages, particularly during the sampling, data collection, and analysis.

Regarding sampling, one limitation of the study is that the total number of individuals approached for participation is not possible to know. This is because the emails to participate in the study - both for the interviews and the questionnaires - were sent by a committee, and therefore it is unclear how many individuals were actually approached. As a result, it is difficult to determine if the sample size for the questionnaires is representative or not. In future studies, it would be beneficial to have a more direct approach for recruiting participants and to keep a record of the total number of individuals contacted. Moreover, it would also be crucial to

increase the questionnaires' sample size for enhancing the accuracy and reliability of the results, leading to improved scale reliability and greater differentiation among the presented variables. This is especially important when the means are close to each other, and the standard deviations are large. To improve this situation, it could be important to approach the institutes directly, promoting presentations that outline the goals and potential benefits of the project, and sending additional reminders to encourage participation.

It is also important to consider that all participants were volunteers, and probably these volunteers are already more sensitive to social issues (otherwise they wouldn't have participated) and might not be so representative for their class. This means we might be missing some important skills that would be more relevant to address for this target population. In any case, the proposed training will most likely be optional, which means that probably only the leaders that are most sensitive to social issues will attend.

Another challenge at the beginning of this study was the difficulty in reaching team members. The initial idea was to have paired samples, having both the leaders and respective team members participating in the study to compare their perceptions. However, many of the leaders did not provide the contacts of their team members in the questionnaires, and many of the contacted team members did not respond. This resulted in a very small sample size of team members (N=6), which was not enough for statistical analysis. One potential solution for this would be sending the questionnaires for all team members whose direct supervisors are Post-docs, in order to have a significant sample size, instead of trying to do the paired analysis. Regardless, it is important to ensure that team members complete the questionnaire prior to the implementation of the training program, because this will facilitate the evaluation of the program's effectiveness, particularly in terms of its impact on behavior and results.

During data collection, other challenges were faced. For example, during the focus groups with the team members, they would often refer to their group leaders instead of their direct supervisors (the PIs of the study), even though they were warned a few times that the conversation was about their direct supervisors. When this confusion was detected, the question would be asked again, emphasizing it was about their direct supervisors. Also, during the analysis, any information clearly about their group leaders would be disregarded. However, in other cases, it was unclear if they were referring to their group leaders or their direct supervisors. This may have led to some inconsistencies in the analysis (for example, when comparing shown competencies and competencies to develop). A way to improve this situation would be to modify the questions or frequently remind them the subject to help ensure that participants are clear on which role they are referring to in their responses.

Additionally, in the PIs interview script, there was a limitation regarding the clarity of the question about what the PI's main tasks were. This question was intended to learn about their main tasks as leaders (leadership tasks), but they also reported to their daily tasks. To prevent this situation, it would be beneficial to rephrase the interview question to clearly differentiate between leadership tasks and other responsibilities.

During the analysis, other issues were faced. For example, for the template analysis, the number of people that mentioned each topic was counted, rather than the number of times a topic was mentioned. However, in the focus groups, participants may have refrained from mentioning a topic because they felt it had already been covered by someone else. This could have led to an underestimation of the number of people who agreed with a certain topic. In order to have a more accurate number of participants mentioning each topic, it would be important to ask every time if anyone agrees or disagrees with what has been said.

Finally, regarding the intervention proposal, it is important to keep in mind that the interview itself is already considered an intervention as well: participants sometimes tend to mention team leadership skills as being important or to include leadership tasks possibly because that is the main topic of the interview, and they become immediately more aware of the topic even before the planned intervention.

Concerning the training program itself, it was originally designed to be delivered in a presential format, which would allow for more direct interaction between the trainers and the participants. In a face-to-face setting, trainers can observe participants' body language and facial expressions, which can help them to evaluate their level of engagement and understanding. Additionally, group activities and discussions are easier to facilitate in person. However, we recognize that some parts of the training could be adapted to a b-learning format, which would provide additional benefits such as increased flexibility for participants. By allowing participants to complete some portions of the training online, they could better fit the training into their busy schedules.

In summary, although this project faced some challenges along the way, and improvements should be considered in future studies, it still provides valuable insights and techniques to develop leadership competencies that are lacking in the scientific community.

References

- Abramo, G., & D'Angelo, C. A. (2014). How do you define and measure research productivity? *Scientometrics*, *101*, 1129–1144.
- Bluedorn, A. C. (1982). A Unified Model of Turnover from Organizations. *Human Relations*, *35*(2), 135–153. <https://doi.org/10.1177/001872678203500204>
- Bray, R. M., Kerr, N. L., & Atkin, R. S. (1978). Effects of group size, problem difficulty, and sex on group performance and member reactions. *Journal of Personality and Social Psychology*, *36*, 1224–1240. <https://doi.org/10.1037/0022-3514.36.11.1224>
- Brooks, J., McCluskey, S., Turley, E., & King, N. (2015). The Utility of Template Analysis in Qualitative Psychology Research. *Qualitative Research in Psychology*, *12*(2), 202–222. <https://doi.org/10.1080/14780887.2014.955224>
- Bubshait, A. A., & Farooq, G. (1999). Team building and project success. *Cost Engineering*, *41*(7), 34–38.
- Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? A meta-analysis. *The Leadership Quarterly*, *17*(3), 288–307. <https://doi.org/10.1016/j.leaqua.2006.02.007>
- Callaway, E. (2019). Scooped in science? Relax, credit will come your way. *Nature*, *575*(7784), 576–577. <https://doi.org/10.1038/d41586-019-03648-4>
- Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision making. In *Individual and group decision making: Current issues*. (pp. 221–246). Lawrence Erlbaum Associates, Inc.
- Chernoff, J. (2018). How to get and keep your lab funded. *Molecular Biology of the Cell*, *29*(21), 2519–2521. <https://doi.org/10.1091/mbc.E18-07-0416>
- Cheruvilil, K. S., Soranno, P. A., Weathers, K. C., Hanson, P. C., Goring, S. J., Filstrup, C. T., & Read, E. K. (2014). Creating and maintaining high-performing collaborative research teams: the importance of diversity and interpersonal skills. *Frontiers in Ecology and the Environment*, *12*(1), 31–38. <https://doi.org/https://doi.org/10.1890/130001>
- Coutu, D., & Kauffman, C. (2009). What Can Coaches Do for You? *Harvard Bus Rev*, *87*.

- Day, D. V., & Dragoni, L. (2015). Leadership Development: An Outcome-Oriented Review Based on Time and Levels of Analyses. *Annual Review of Organizational Psychology and Organizational Behavior*, 2(1), 133–156. <https://doi.org/10.1146/annurev-orgpsych-032414-111328>
- Deci, E. L., & Ryan, R. M. (2000). The “What” and “Why” of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- FCT. (2022). *Aviso para apresentação de candidaturas a Projetos de I&D em todos os Domínios Científicos*. https://former.fct.pt/apoios/projectos/concursos/ICDT/docs/ICDT_AAC_2022.pdf
- FCT, & MIT Portugal. (2022). *2022 Call for Exploratory Research Projects under the MIT Portugal Program*. <https://myfct.fct.pt/LibDocument/DocumentPatterns.FileDisplay.aspx?EcryptDoctId=cUJ3b6XXbhrIMmbjd8UB1Q%3D%3D>
- Fleishman, E. A., & Zaccaro, S. J. (1992). Toward a taxonomy of team performance functions. In *Teams: Their training and performance*. (pp. 31–56). Ablex Publishing.
- Fundação para a Ciência e Tecnologia. (2022). *Final Results from Call of IC&DT Projects in all Scientific Domains 2022*. December 14. <https://www.fct.pt/en/resultados-finais-do-concurso-de-projetos-icdt-em-todos-os-dominios-cientificos-de-2022/>
- Fundação para a Ciência e Tecnologia. (2023). *About FCT*. <https://www.fct.pt/en/sobre/a-fct/>
- George, J. M. (1996). Group effective tone. In J. Wiley (Ed.), *Handbook of work group psychology* (pp. 77–93). M. A. West (Ed.).
- Gorup, M., & Laufer, M. (2020). When Relationships Between Supervisors and Doctoral Researchers Go Wrong. *Elephant in the Lab*. <https://doi.org/10.5281/zenodo.4213175>
- Graça, A. M., & Passos, A. M. (2015). Team leadership across contexts: a qualitative study. *Leadership & Organization Development Journal*, 36(5), 489–511. <https://doi.org/10.1108/LODJ-08-2013-0114>
- Hackman, J. R. (1987). The design of work teams. *The Handbook of Organizational Behavior*, 315–342.

- Hackman, J. R., & Walton, R. E. (1986). Leading groups in organizations. In P. S. Goodman (Ed.), *Designing effective work groups*. Jossey-Bass.
- Hill, G. W. (1982). Group versus individual performance: Are N + 1 heads better than one? *Psychological Bulletin*, *91*, 517–539. <https://doi.org/10.1037/0033-2909.91.3.517>
- Hoegl, M. (2005). Smaller teams–better teamwork: How to keep project teams small. *Business Horizons*, *48*(3), 209–214.
<https://doi.org/https://doi.org/10.1016/j.bushor.2004.10.013>
- Kelle, U. (2006). Combining qualitative and quantitative methods in research practice: purposes and advantages. *Qualitative Research in Psychology*, *3*(4), 293–311.
<https://doi.org/10.1177/1478088706070839>
- Kelloway, E. K., & Barling, J. (2010). Leadership development as an intervention in occupational health psychology. *Work and Stress*, *24*(3), 260–279.
<https://doi.org/10.1080/02678373.2010.518441>
- Kim, J.-S., & Corn, J. E. (2018). Sometimes you're the scooper, and sometimes you get scooped: How to turn both into something good. *PLOS Biology*, *16*(7), e2006843.
<https://doi.org/10.1371/journal.pbio.2006843>
- King, N. (2014). *What is Template Analysis? - University of Huddersfield*.
<https://research.hud.ac.uk/research-subjects/human-health/template-analysis/what-is-template-analysis/>
- Kirkpatrick, D. L. (1979). Techniques for evaluating training programs. *Training and Development Journal*.
- Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. *Handbook of Psychology: Industrial and Organizational Psychology, Vol. 12.*, 333–375.
- Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the Effectiveness of Work Groups and Teams. *Psychological Science in the Public Interest*, *7*(3), 77–124.
<https://doi.org/10.1111/j.1529-1006.2006.00030.x>
- Locke, E. A., & Latham, G. P. (1990). A theory of goal setting & task performance. In *A theory of goal setting & task performance*. (pp. xviii, 413–xviii, 413). Prentice-Hall, Inc.

- Malone, T., & Crowston, K. (1993). *The Interdisciplinary Study of Coordination*. *Massachusetts Institute of Technology (MIT), Sloan School of Management, Working Papers*, 26. <https://doi.org/10.1145/174666.174668>
- Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A Temporally Based Framework and Taxonomy of Team Processes. *Academy of Management Review*, 26(3), 356–376. <https://doi.org/10.5465/amr.2001.4845785>
- Mathieu, J. E., D’Innocenzo, L., & Kukenberger, M. R. (2015). Contextual Issues in Project Performance: A Multilevel Perspective. In F. Chiochio, Kelloway, & B. Hobbs (Eds.), *The Psychology and Management of Project Teams: An Interdisciplinary Perspective* (p. 0). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199861378.003.0005>
- McGrath, J. E. (1964). *Social Psychology: A Brief Introduction*. Holt, Rinehart and Winston. <https://books.google.pt/books?id=N9deSQAACAAJ>
- Milojević, S. (2014). Principles of scientific research team formation and evolution. *Proceedings of the National Academy of Sciences*, 111(11), 3984–3989. <https://doi.org/10.1073/pnas.1309723111>
- Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in Teams: A Functional Approach to Understanding Leadership Structures and Processes. *Journal of Management*, 36(1), 5–39. <https://doi.org/10.1177/0149206309347376>
- Nature. (2023). *Editorial criteria and processes*. <https://www.nature.com/nature/for-authors/editorial-criteria-and-processes>
- NIH. (2023). *Success Rates: R01-Equivalent and Research Project Grants*. <https://report.nih.gov/nihdatabook/category/10>
- O’Grady, C. (2021). Risk of being scooped drives scientists to shoddy methods. *Science*. <https://doi.org/10.1126/science.abg7896>
- Parkes, E. (2019). Scientific progress is built on failure. *Nature*. <https://doi.org/10.1038/d41586-019-00107-y>
- Qu, S. Q., & Dumay, J. (2011). The qualitative research interview. *Qualitative Research in Accounting & Management*, 8(3), 238–264. <https://doi.org/10.1108/11766091111162070>

- Ragab, M., & Arisha, A. (2018). Research Methodology in Business: A Starter's Guide. *Management and Organizational Studies*, 5. <https://doi.org/10.5430/mos.v5n1p1>
- Rahim, M. A. (1983). A measure of styles of handling interpersonal conflict. In *Academy of Management Journal* (Vol. 26, pp. 368–376). Academy of Management. <https://doi.org/10.2307/255985>
- Ritchey, M. (2020). *The Memory Modulation Lab*. https://docs.google.com/document/d/1L1DhF3gKZKVGB_MDEmdqvBwm5thWiqyMy8AS_kzJnSM/edit#
- Santos, J. P., Caetano, A., & Tavares, S. M. (2015). Is training leaders in functional leadership a useful tool for improving the performance of leadership functions and team effectiveness? *Leadership Quarterly*, 26(3), 470–484. <https://doi.org/10.1016/j.leaqua.2015.02.010>
- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, 52(4), 1893–1907. <https://doi.org/10.1007/s11135-017-0574-8>
- Schaufeli, W., Salanova, M., González-romá, V., & Bakker, A. (2002). The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. *Journal of Happiness Studies*, 3(1), 71–92. <https://doi.org/10.1023/A:1015630930326>
- Skakon, J., Nielsen, K., Borg, V., & Guzman, J. (2010). Are leaders' well-being, behaviours and style associated with the affective well-being of their employees? A systematic review of three decades of research. *Work and Stress*, 24(2), 107–139. <https://doi.org/10.1080/02678373.2010.495262>
- Slowikowski, M. K. (2005). Using the DISC Behavioral Instrument to Guide Leadership and Communication. *AORN Journal*, 82(5), 835–843. [https://doi.org/10.1016/S0001-2092\(06\)60276-7](https://doi.org/10.1016/S0001-2092(06)60276-7)
- Sundstrom, E., De Meuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. *American Psychologist*, 45(2), 120–133. <https://doi.org/10.1037/0003-066X.45.2.120>

- Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the Hawthorne studies to work teams of the 1990s and beyond. *Group Dynamics: Theory, Research, and Practice*, 4, 44–67. <https://doi.org/10.1037/1089-2699.4.1.44>
- Tekleab, A. G., Quigley, N. R., & Tesluk, P. E. (2009). A Longitudinal Study of Team Conflict, Conflict Management, Cohesion, and Team Effectiveness. *Group & Organization Management*, 34(2), 170–205. <https://doi.org/10.1177/1059601108331218>
- Regulamento n.º 709/2019, de 10 de setembro da Universidade Nova de Lisboa - Faculdade de Ciências Médicas, (2019). <https://dre.pt/dre/detalhe/regulamento/709-2019-124573220>
- Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How Reliable are Measurement Scales? External Factors with Indirect Influence on Reliability Estimators. *Procedia Economics and Finance*, 20, 679–686. [https://doi.org/https://doi.org/10.1016/S2212-5671\(15\)00123-9](https://doi.org/https://doi.org/10.1016/S2212-5671(15)00123-9)
- Waters, B. (2021). *Should you care about Journal Impact Factor?* <https://sciwriting.blog/should-you-care-about-journal-impact-factor/>
- Yammarino, F. (2013). Leadership: Past, present, and future. *Journal of Leadership and Organizational Studies*, 20(2), 149–155. <https://doi.org/10.1177/1548051812471559>
- Young-Powell, A. (2018). When the relationship with your PhD supervisor turns toxic. *The Guardian*. <https://www.theguardian.com/education/2018/jan/22/when-the-relationship-with-your-phd-supervisor-turns-toxic>
- Yu, S., Bedru, H. D., Lee, I., & Xia, F. (2019). Science of Scientific Team Science: A survey. *Computer Science Review*, 31, 72–83. <https://doi.org/https://doi.org/10.1016/j.cosrev.2018.12.001>
- Yukl, G., Gordon, A., & Taber, T. (2002). A Hierarchical Taxonomy of Leadership Behavior: Integrating a Half Century of Behavior Research. *Journal of Leadership & Organizational Studies*, 9(1), 15–32. <https://doi.org/10.1177/107179190200900102>
- Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *Leadership Quarterly*, 12(4), 451–483. [https://doi.org/10.1016/S1048-9843\(01\)00093-5](https://doi.org/10.1016/S1048-9843(01)00093-5)

Appendixes

Appendix I

Project presentations

I.1. Project presentation to COLife






OVERVIEW

Research teams operate in a very demanding environment. Therefore, it is important to keep teams focused and motivated. This task rests ultimately with the Group Leader, but also with the Postdocs and Staff scientists, who are responsible for running their own projects and, at the same time, supervising directly other group members, such as students.

The main goal of this project is to help Senior PostDocs/Staff Scientists improving their leadership strategies and practices towards a more effective team performance.

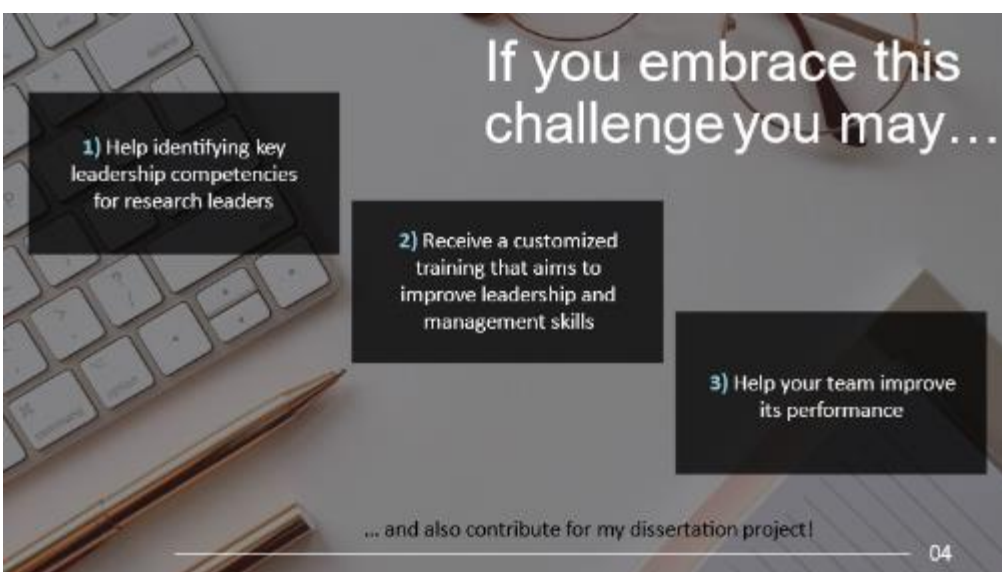
03



APPROACH

- 1- Identify the leadership skills considered most relevant for research groups
 - Interviews (Staff Scientists/Senior PostDocs)
 - Focus groups (group members)
 - Online surveys (all)
- 2- Design a customized training programme
- 3- General results of the study and the programme will be available to those interested

06



If you embrace this challenge you may...

- 1) Help identifying key leadership competencies for research leaders
- 2) Receive a customized training that aims to improve leadership and management skills
- 3) Help your team improve its performance

... and also contribute for my dissertation project!

04



If you got curious and want to participate, please contact me:

Ana Margarida Figueira
amsfa2@iscte-iul.pt

I.2. Project presentation to Principal Investigators (sent in the email)

iscte UNIVERSITY INSTITUTE OF LISBON

MM Instituto de Medicina Molecular João Lobo Antunes

PROJECT PROPOSAL

Improve management and leadership skills in research teams, in a time of remote work

About me

Hi! I am Margarida and you might remember seeing me around iMM!

I did my Master thesis at iMM in 2012/2013. After finishing it, I worked as a researcher at IGC for a few years and then moved back to iMM in 2017, to become a Lab Manager!

Last year, I decided to take a new direction and integrate the Master in Human Resources Management. My main goal is to contribute for people development!

I love to travel, get to know new places, meet new people, their stories and experiences!

02



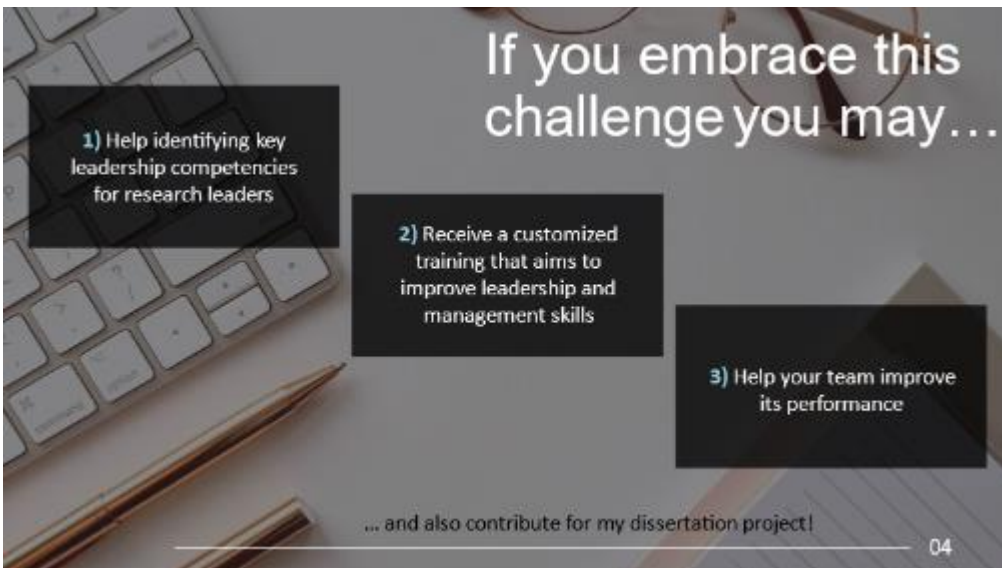
OVERVIEW

Research teams operate in a very demanding environment. Therefore, it is important to keep teams focused and motivated. Principal Investigators (PIs) take responsibility for the research project, but also for the management and development of their teams.

Despite the extensive research training of these leaders, they face a relevant training gap in leadership and management skills, which is reinforced by science funding organizations.

The main goal of this project is to help PIs improving their leadership strategies and practices towards a more effective team performance.

03

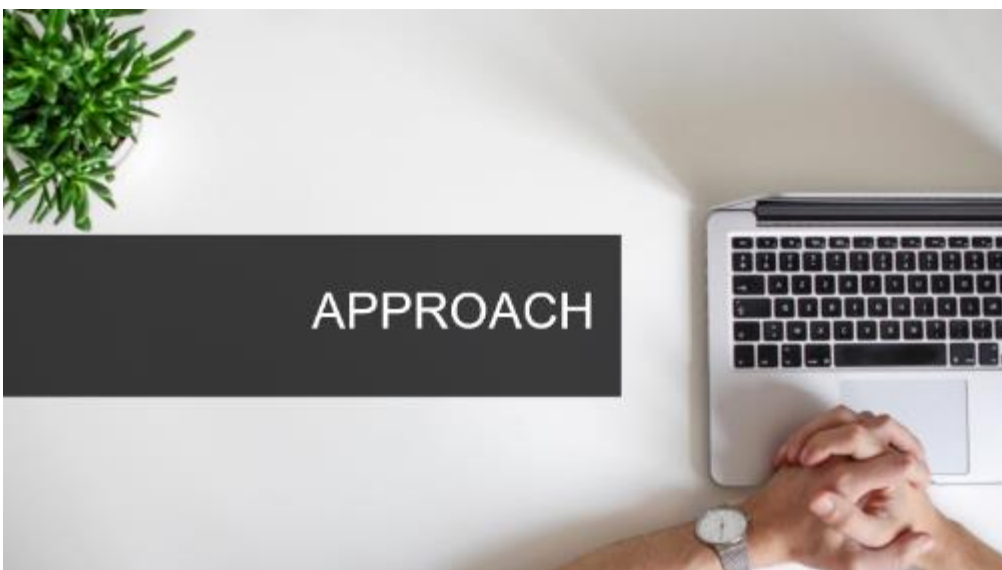


If you embrace this challenge you may...

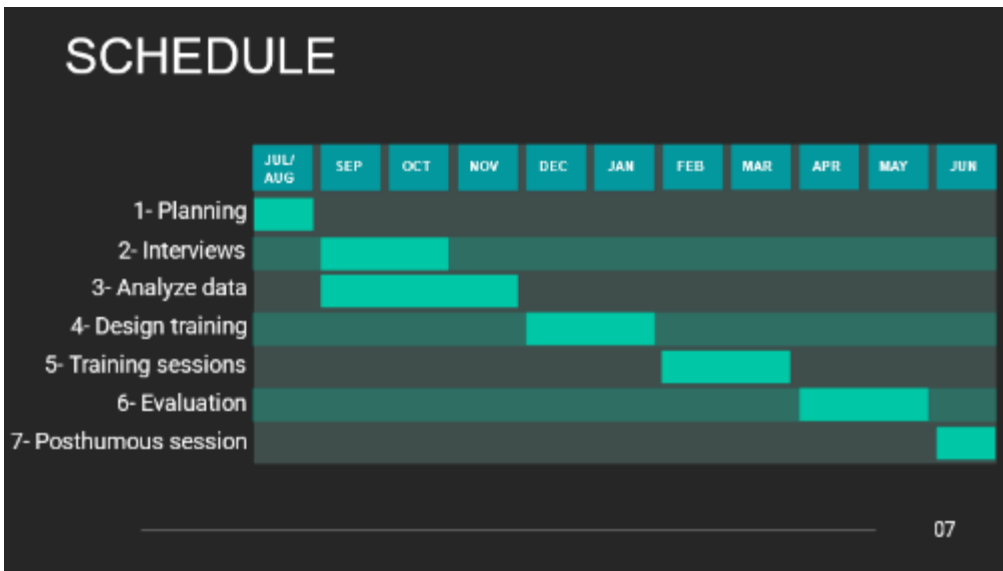
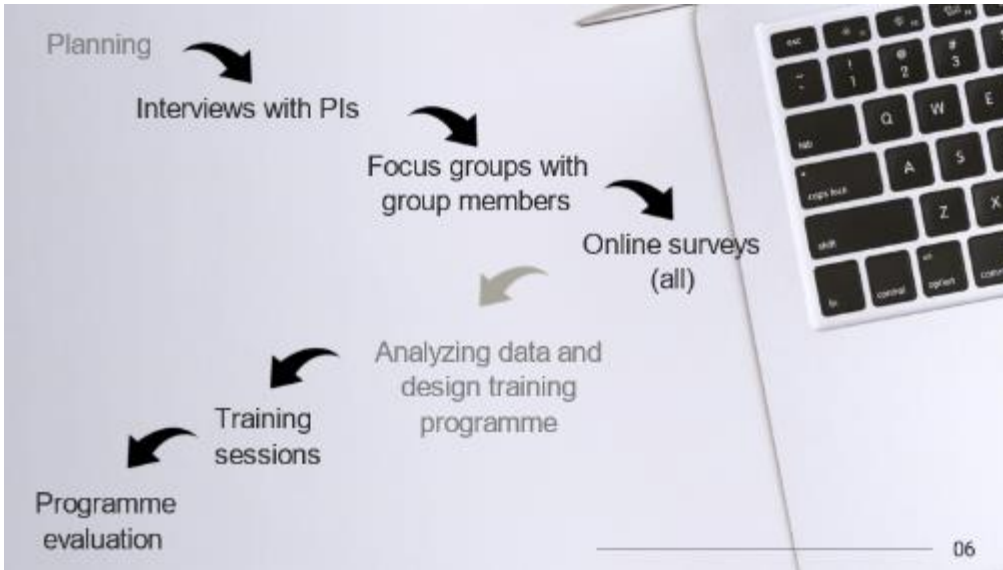
- 1) Help identifying key leadership competencies for research leaders
- 2) Receive a customized training that aims to improve leadership and management skills
- 3) Help your team improve its performance

... and also contribute for my dissertation project!

04



APPROACH



The Team

Ana Margarida Figueira
Project responsible

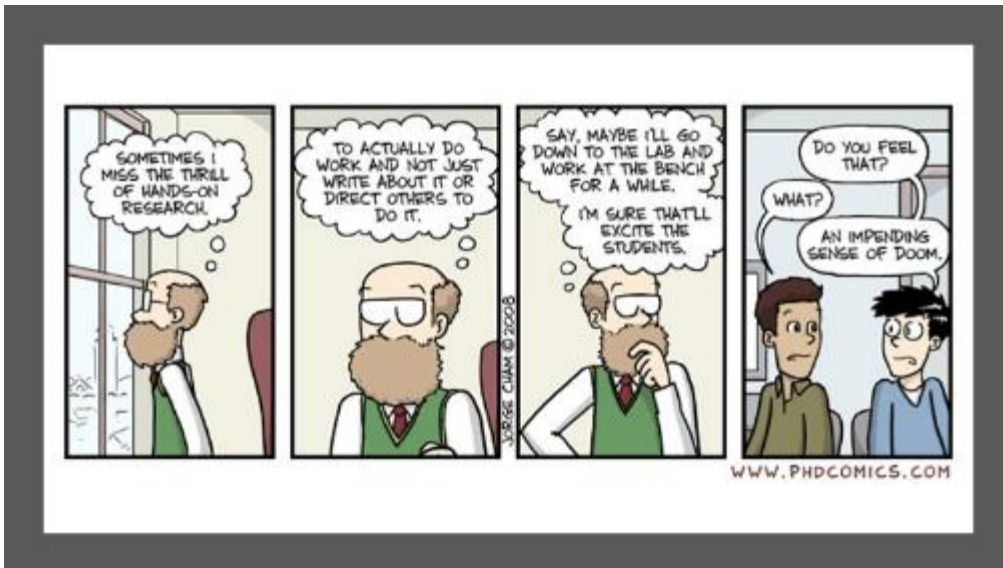
Patrícia Costa
Project supervisor @ISCTE

Sofia Santos
HR Director @ IMM and Project collaborator

08

If you got curious and want to participate, please contact me:

Ana Margarida Figueira
amsfa2@iscte-iul.pt



Appendix II

Leaders' demographics

Table 8

Leader's sociodemographics: Institute, Position, Tenure and Gender (frequencies)

	Frequencies	Valid Percent
Institute		
CEDOC	1	3,57
Champalimaud	1	3,57
iBET	1	3,57
iMM	12	42,86
ITQB NOVA	12	42,86
IGC	1	3,57
Total	28	100
Position		
Group Leader	3	10,71
Post-doc	18	64,29
Research fellow	1	3,57
Other	6	21,43
Total	28	100
Tenure		
5-6 years	1	3,57
7-8 years	2	7,14
9-10 years	2	7,14
More than 10 years	23	82,14
Total	28	100
Gender		
Female	12	42,86
Male	16	57,14
Total	28	100

Table 9

Leader's sociodemographics: Age (years), Number of projects, Number of publications, Years supervising and Number of supervised students (Averages, Standard deviations, Minimum and Maximum values)

	Average	Std dv	Min	Max
Age	40,21	5,86	27,00	53,00
Number of Projects involved	1,86	3,14	0,00	16,00
Number of Scientific publications	24,04	27,33	4,00	130,00
Supervising for how long (years)	4,29	1,76	1,00	7,00
Number of Supervised students	7,37	4,67	1,00	20,00

Appendix III

Individual Interview Script

Introduction

Good morning/Good afternoon. Thank you for participating and collaborating in this project. My name is Margarida and I am finishing the Master in Human Resources Management and Organizational Consultancy at ISCTE.

Currently I am developing my Master's thesis project about the development of leadership skills in research team leaders, with a particular focus on Principal Investigators (PIs). In order to better understand PIs' needs regarding this subject, I will ask you a few questions.

To perform the best analysis possible and to avoid information loss, I would like to ask for your permission to record this interview, in an audio format. Your anonymity will be guaranteed, and your name will never be mentioned under any circumstances. Also, all aspects mentioned here are confidential and will exclusively be used for research purposes.

The interview is structured in 2 parts, the first one is about your personal experience, and the second is more focused on leadership skills.

Can we start the interview?

Thank you!

Part I – Characterization

- 1- Currently, where are you working at?
- 2- What is your area of research?
- 3- Are you or have you been the PI of any project?
- 4- For how long have you been a PI?
- 5- How many projects have been financed with you as the PI?
- 6- In which countries have you been in this position?
- 7- How many people are you supervising at the moment?
- 8- What was the maximum number of people you have been responsible for at the same time?
- 9- Where would you like to be in 5 years?
 - a. Would you consider becoming a Group leader? Why/Why not?

Part II – Training

- 10- What motivated you for participating?
- 11- What do you perceive as being the main PI tasks?

- 12- How would you describe the relationship of most PIs and their teams?
- a. Example of positive situation
 - b. Example of negative situation
- 13- Can you tell me a bit about your experience in managing a team?
- 14- What do you consider to be your main strengths as a leader?
- a. Can you give some examples why?
- 15- What skills do you feel would be useful for you to develop or improve?
- a. Why?
- 16- What do you think your team would say about you as a leader?
- 17- If leaders of research teams would have a leadership training session, what do you think would be essential to address?
- a. and what do you think would be useless?
- 18- In your perception, which disadvantages could arise from that training?
- 19- What do you think a good leader should have?
- a. Why?
- 20- What do you feel is missing the most in today's research leaders?
- 21- Have you ever participated in any workshop or training program for leadership and team management development?
- a. Was it volunteer, by suggestion or mandatory?
 - b. Who provided the training?
 - c. Which contents were addressed?
 - d. How do you evaluate that experience?

Final remarks

- Is there anything else you would like to add...?
- Note: Ask team members to participate in a focus group!

Appendix IV

Focus Groups Interview Script

A. Introduction

Good morning/Good afternoon. Thank you for participating and collaborating in this project. My name is Margarida and I am finishing the Master in Human Resources Management and Organizational Consultancy at ISCTE.

Currently I am developing my Master's thesis project about the development of leadership skills in research team leaders, with a particular focus on Principal Investigators (PIs). The idea is to design a training plan that may help PIs improving their leadership strategies and practices towards a more effective team performance. In order to better understand team members' needs regarding this subject, I would like to discuss a few questions with you. Please keep in mind we will be discussing about your direct supervisors (PIs), not your group leader.

B. Rules

1. We would like everyone to participate. We may call on you if I haven't heard from you in a while.
2. There are no right or wrong answers. Every person's experiences and opinions are important. Speak up whether you agree or disagree. We expect and want to hear a wide range of opinions and we do not anticipate consensus.
3. We remind you that what is said during this session should remain here. You should be comfortable to share anything, even if more sensitive issues come up.
4. Please give everyone the chance to express his/her opinion during the conversation and let's try having just one speaker at a time. You can address each other if you like, and you can interrupt if you feel you really have to.
5. The discussion should last for about one hour. We ask you to avoid having any possible distractors near you, like your mobile phones.
6. We will record this session as we want to capture everything you have to say. We will not identify anyone by name. When you answer, be sure to not mention your name. You will remain anonymous. Audio recordings will be summarized and used for research purposes only. The recordings will be destroyed at the end of the project. Also, we can provide summary details once the study is complete.

Are there any questions?

C. Interview

Part I – Presentation of participants

- 1- You can start by presenting yourselves, by telling your name, your position, how many groups have you worked in and what is now your main research area.
- 2- (Ice breaker) I would like to start by asking you, when you have to describe what you do to a child, what do you say?

Part II – Personal experiences

- 3- Can you tell us about your experience with your supervisors?
 - a. Were those experiences mainly positive or negative and why (if you have been in different groups, please report the different experiences separately)?
 - b. Can you give examples or report any experience you have had OR SEE where it was clear the lack of leadership skills?
 - c. How would you characterize your supervisor?

Part III – Supervisors' skills

- 4- What skills do you think a good supervisor should have and why?
 - a. What do you feel is missing the most?
 - b. What skills do you feel would be useful for them to develop or improve and why?

Part IV – Leadership training

- 5- What is your opinion about the way PIs are evaluated by funding agencies, namely FCT?
 - a. Do you think this is enough?
 - b. What do you think about PIs not receiving support for managing teams?
 - c. Why do you think it could be important?
 - d. How do you think group members could benefit from their PIs having leadership training?
 - e. If you could propose some modules, what topics would you bring?
 - f. Can you think about any disadvantages that could arise from that training?
 - g. PIs may also show good leadership and management skills. Where do you think these come from?

Final remarks

- Is there anything else you would like to add...?

Appendix V

Questionnaires for Leaders



Dear participant,

This survey is part of my thesis project, from the Master in Human Resources and Organizational Consultancy at ISCTE Business School.

The general goal of this project is to design a training program to develop team competencies (in research teams).

Your collaboration is very important, but your participation should be voluntary and you may withdraw at any time. All collected data is confidential and will only be used for research purposes.

If you agree to participate, please answer the questions as best you can. There are no right or wrong answers.

This survey should take approximately 10 minutes to complete.

If you have any questions or concerns, please contact me by e-mail: amsfa2@iscte-iul.pt.

Thank you for your collaboration!

If you agree to participate, please check the box bellow:

- Yes, I understand the conditions and I agree to participate in this study.



Please consider yourself in your supervisor role. To what extend do you agree with the following statements?

Usually, I...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Identify when key aspects of the work need to be completed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help provide a clear vision of where the team is going.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contribute ideas to improve how the team performs its work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Request task-relevant information from team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suggest new ways of looking at how to complete work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will work along with the team to get its work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define and structure my work and the work of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work with the team to develop the best possible approach to its work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will "roll up my sleeves" and help the team do its work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitor team and team member performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keep the team informed about what other teams are doing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intervene to help team members get the work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emphasize the importance and value of questioning team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensure the team has a clear direction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensure the team has a clear understanding of its purpose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



What competencies do you consider most relevant for a supervisor to have? Please rank the following competencies by dragging them (1 – the most relevant; 15 – the less relevant):

- Monitor team
- Select individuals to compose a team
- Train and develop team
- Provide feedback
- Perform some of the team's task work
- Provide resources (information, materials, equipment, people, services)
- Establish expectations and goals
- Support social climate
- Facilitate the team's understanding of internal and external events
- Solve problems (directly or by supporting the team solving them)
- Structure and plan the work
- Manage the relationship between the team and external entities/groups/factors
- Encourage team self-management
- Challenge team
- Define mission or purpose for the team



Please consider yourself in your supervisor role. To what extent do you agree with the following statements?

Usually, I...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Seek multiple different perspectives when solving problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourage the team to solve its own problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Implement or help the team implement solutions to problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make sure the team has the necessary problem solving and interpersonal skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintain clear standards of performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourage the team to be responsible for determining the methods, procedures, and schedules with which the work gets done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Review relevant performance results with the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide positive feedback when the team performs well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourage the team to make most of its own work-related decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define and emphasize team expectations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Set or help set challenging and realistic goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage in actions that demonstrate respect and concern for team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help new team members learn how to do the work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respond promptly to team member needs or concerns.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Look out for the personal well-being of team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help new team members to further develop their skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide corrective feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help the team develop solutions to task and relationship-related problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Please consider yourself in your supervisor role. To what extent do you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I ensure that support of diversity is present as well monitored in virtual settings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The digital communication means I use are inclusive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use a diverse spectrum of digital communication methods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my digital communication, I am careful NOT to convey unintended messages that leave the receiver feeling insulted or angry because of tone or misunderstandings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my digital communication, I am clear, well organized and allow feedback to avoid errors and untested assumptions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I ensure that my digital communication is not excessive to the point of impeding the ability of group members to get their work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am aware and active in terms of cyber-security efforts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I stay abreast of new Information Communication Technologies (ICTs) and new enhancements of ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not allow virtual technologies to intrude into my students' lives excessively.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Within the digital environment, I am able to create a sense of trust with regard to honesty, consistency, follow-through, fairness and general integrity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have sufficient skills and inclination to deal with various types of technology breakdowns in both personal and enterprise settings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I ensure that each group member receives at least some personalized digital communication.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Please provide some information about yourself. We remind you that all of this information is confidential, and will only be used in an aggregated form.

Where are you working at?

- Centro de Estudos de Doenças Crónicas da NOVA Medical School (CEDOC-NMS)
- Champalimaud Research Centre - Fundação Champalimaud
- Instituto de Biologia Experimental e Tecnológica (IBET)
- Instituto de Medicina Molecular João Lobo Antunes (IMM)
- Instituto de Tecnologia Química e Biológica António Xavier da Universidade NOVA de Lisboa (ITQB NOVA)
- Instituto Gulbenkian de Ciência (IGC)
- Other

What is your area of research?

What is your position at the Institute/Research Centre?

- Group Leader
- Post-doc
- PhD student
- Master student
- Technician
- Research fellow
- Other

How many years have you been in that position?

- Less than 1 year
- 1-2 years
- 3-4 years
- 5-6 years
- 7-8 years
- 9-10 years
- More than 10 years

Apart from the Group Leader, how many members does your group have at the moment?

Are you or have you been the Principal Investigator (PI) or co-PI of any financed project?

Yes

No

If so, how many projects so far?

How many scientific publications do you have in total? Please type a number.

How many scientific publications do you have as first author? Please type a number.

How many books or book chapters have you written? Please type a number.

How many patents do you have? Please type a number.

Are you or have you been responsible for supervising other group members?

Yes

No

How many so far (total)?

How many at the moment?

For how long have you been supervising other group members?

- Less than 1 year
- 1-2 years
- 3-4 years
- 5-6 years
- 7-8 years
- 9-10 years
- More than 10 years

Would you like to become a Group Leader?

- Yes
- Maybe, it depends
- I am not sure yet
- No
- I am already a Group Leader

What's your degree in (area)?

What is your nationality?

What is your gender?

- Male
- Female
- Other

What is your age (in years)?



Do you have any further comments about this topic you would like to share? Please leave your comment bellow:

Are you supervising anyone at the moment?

- Yes
- No



In order to have a broader vision on this subject, it would be important to invite team members also to participate on this survey.

If you answered "Yes" in the previous question, could you please provide the e-mails of the members you supervise at the moment? Thank you!

E-mail 1	<input type="text"/>
E-mail 2	<input type="text"/>
E-mail 3	<input type="text"/>
E-mail 4	<input type="text"/>
E-mail 5	<input type="text"/>

In order to match your team's answers, please provide a code for your team in the box bellow. You can use the last letter of your Research Institute acronym, followed by the first letter of your name and, lastly, the last 2 digits of your birth year. For example, if you work at iMM, your name is João and you were born in 1979, your team's code would be "MJ79".



Appendix VI

Questionnaires for Team members

ISCTE  Instituto Universitário de Lisboa

Dear participant,

This survey is part of my thesis project, from the Master in Human Resources and Organizational Consultancy at ISCTE Business School.

The general goal of this project is to design a training program to develop team competencies (in research teams).

Your collaboration is very important, but your participation is voluntary and you may withdraw at any time. All collected data is confidential and will only be used for research purposes.

If you agree to participate, please answer the questions to your best knowledge. There are no right or wrong answers.

This survey should take approximately 10 minutes to complete.

If you have any questions or concerns, please contact me by e-mail: amsfa2@iscte-iul.pt.

Thank you for your collaboration!

If you agree to participate, please check the box bellow:

Yes, I understand the conditions and I agree to participate in this study.



ISCTE  Instituto Universitário de Lisboa

Please insert the code you have received by e-mail bellow:



Please consider your direct supervisor (NOT your Group Leader). To what extent do you agree with the following statements?

My supervisor...

	Strongly disagree	Disagree	Somewhat disagree	Nether agree nor disagree	Somewhat agree	Agree	Strongly agree
Defines and emphasizes expectations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintains clear standards of performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sets or helps set challenging and realistic goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes sure we have the necessary problem solving and interpersonal skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helps new team members learn how to do the work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helps new team members to further develop their skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reviews relevant performance results with us.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides positive feedback when we perform well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides corrective feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Implements or helps the team implement solutions to problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeks multiple different perspectives when solving problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helps the team develop solutions to task and relationship-related problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourages the team to be responsible for determining the methods, procedures and schedules with which the work gets done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourages the team to make most of its own work-related decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourages the team to solve its own problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Responds promptly to team member needs or concerns.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engages in actions that demonstrate respect and concern for team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Looks out for the personal well-being of team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



What competencies do you consider most relevant for a supervisor to have? Please rank the following competencies by drag & drop (1 – the most relevant; 15 – the less relevant):

- Perform some of the team's task work 1
- Challenge team 2
- Encourage team self-management 3
- Solve problems (directly or by supporting the team solving them) 4
- Train and develop team 5
- Define mission or purpose for the team 6
- Structure and plan the work 7
- Monitor team 8
- Establish expectations and goals 9
- Select individuals to compose a team 10
- Support social climate 11
- Manage the relationship between the team and external entities/groups/factors 12
- Provide feedback 13
- Provide resources (information, materials, equipment, people, services) 14
- Sensemaking (facilitate the team's understanding of internal and external events) 15



Please consider once again your direct supervisor (NOT your Group Leader). To what extent do you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Ensures we have a clear direction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensures we have a clear understanding of our purpose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helps provide a clear vision of where we are going.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Defines and structures own work and our work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identifies when key aspects of the work need to be completed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Works with us to develop the best possible approach to our work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitors team and team member performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keeps us informed about what other teams are doing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Requests task-relevant information from us.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emphasizes the importance and value of questioning team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suggests new ways of looking at how to complete work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contributes ideas to improve how we perform our work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will "roll up his/her sleeves" and help us do our work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will work along with us to get our work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intervenes to help us get the work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Please consider your direct supervisor (NOT your Group Leader) and his/her digital communication. To what extent do you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
In his/her digital communication, my supervisor is clear, well organized and allows feedback to avoid errors and untested assumptions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In his/her digital communication, my supervisor is careful NOT to convey unintended messages that leave the receiver feeling insulted or angry because of tone or misunderstandings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor ensures that his/her digital communication is not excessive to the point of impeding the ability of group members to get their work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor ensures that each member receives at least some personalized digital communication.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor uses a diverse spectrum of digital communication methods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The digital communication means used by my supervisor are inclusive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor stays abreast of new Information Communication Technologies (ICTs) and new enhancements of ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor has sufficient skills and inclination to deal with various types of technology breakdowns in both personal and enterprise settings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor is aware and active in terms of cyber-security efforts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Within the digital environment, my supervisor is able to create a sense of trust with regard to honesty, consistency, follow-through, fairness and general integrity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor does not allow virtual technologies to intrude into group members' lives excessively.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor ensures that support of diversity is present as well monitored in virtual settings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Please think about yourself and how you felt at your current workplace over the last month. To what extent do you agree to the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
At my work, I feel that I am bursting with energy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At my job, I feel strong and vigorous.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I get up in the morning, I feel like going to work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am enthusiastic about my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My job inspires me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am proud of the work that I do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel happy when I am working intensely.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am immersed in my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get carried away when I am working.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please consider the group or the team you are working with. To what extent do you agree to the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
This team should not continue to function as a team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I had the chance, I would have switched teams.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be happy to work with the team members on other projects in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Considering your career plans, how do you rate your chances of still working at your lab...

	Chances are very big	Chances are big	Chances are even	Chances are small	Chances are very small
...6 months from now?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...1 year from now?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...3 years from now?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Imagine that you could participate in the development of a training program for leaders in the context of scientific research teams. What 3 competencies or aspects would you consider essential to include in the program?



Please provide some information about yourself. We remind you that all of this information is confidential, and will only be used in an aggregated form.

Where are you working at?

- Centro de Estudos de Doenças Crónicas da NOVA Medical School (CEDOC-NMS)
- Champalimaud Research Centre - Fundação Champalimaud
- Instituto de Biologia Experimental e Tecnológica (iBET)
- Instituto de Medicina Molecular João Lobo Antunes (iMM)
- Instituto de Tecnologia Química e Biológica António Xavier da Universidade NOVA de Lisboa (ITQB NOVA)
- Instituto Gulbenkian de Ciência (IGC)
- Other. Where?

What is your position at the Institute/Research Centre?

- Group Leader
- Post-doc
- PhD student
- Master student
- Technician
- Research fellow
- Other. Which?

How many years have you been in that position?

- Less than 1 year
- 1-2 years
- 3-4 years
- 5-6 years
- 7-8 years
- 9-10 years
- More than 10 years

How many years have you been in research (independently of your position)?

- Less than 1 year
- 1-2 years
- 3-4 years
- 5-6 years
- 7-8 years
- 9-10 years
- More than 10 years

How many direct supervisors have you had so far?

What's your degree in (area)?

What is your nationality?

What is your gender?

- Male
- Female
- Other

What is your age (in years)?



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Do you have any further comments about this topic you would like to share? Please leave your comment below:



Appendix VII

Template Analysis

Table 10

Template analysis: all topics raised during Individual interviews and Focus groups, with the number of participants mentioning each topic.

Theme	Topic	Subtopic	Supervisors	Team members	
Own experience					
Motivation to participate	Improve team management skills	TP – Train and develop team	1	0	
		Learn how to motivate the team	1	0	
		Recognizes importance to learn how to manage a team	4	0	
		Learn conflict management	1	0	
		Learn about the subject	2	0	
		Learn to deal with different emotional states	1	0	
		Contribute / Have an impact	Contribute with own experience	6	0
	Lack of interest to help		2	0	
	Lack of training in scientific research		2	0	
	Change the system		1	0	
	Appropriate		1	0	
	To be honest - foreign perspective		1	0	
	PIs (Post-Docs) to have a voice		1	0	
	Clear career expectations	1	0		
Experience managing a team	Action Phase	Encourage team self-management	2	7	
		Solve problems	1	2	
		Support social climate	2	1	
Or		Monitor team	0	4	
		Challenge team	0	1	
Experience with supervisor	Transition Phase	Establish expectations and goals	1	1	
		Train and develop	2	4	
		Provides feedback	0	1	
		Structure and plan	0	4	
		Define mission	0	1	
	Positive		Friendship/Close relationship	2	3
			Give the example	2	0
			Responsibility/Commitment	1	0
			Availability	0	7
			Integration	0	1
	Intrinsic motivation	Teaching	3	0	

		Comfortable in the role	1	0
		Team work	1	0
Hard		Tiring/difficult	2	0
Concerns		AP - Encourage team self-management	1	0
		AP - Monitor team	2	0
		AP - Provide resources	1	0
		TP - Provide feedback	1	0
		TP - Structure and plan	2	0
		TP - Train and develop team	1	0
		Conflict management	1	0
		Stablish a relationship/good interaction	1	0
		Adapt style to people	3	0
		Time management	3	0
Negative		Lack of autonomy	0	1
		Possessive	0	2
		Too much micromanagement	0	1
		Too available /too much effort	0	1
		Few experience	0	2
		Lack of training and development	0	1
		Lack of guidance	0	4
How the team sees you	Positive	Supportive	2	0
		Concerned	2	0
Or		Good supervisor	2	0
		Hard worker	1	0
Characterization of supervisor		Creative	1	0
		Enthusiast	1	0
		Fair	1	0
		Firm	1	0
		Friendship	1	0
		“Human”	1	0
		Nice	1	0
		Present	4	0
		Respectful	1	0
		Spontaneous	1	0
		Sympathy /Approachable	1	0
		Trustful	1	0
		Patient	0	1
		Attentive	0	3
		Available	0	10
		Good teacher	0	2

		Communicative	0	1
		Creative	0	1
		Calm	0	1
		Hard working/committed	0	3
		Knowledge/experience	0	1
		Realistic	0	1
		Friend/caring	0	1
		Focused/organized	0	2
	Negative	Lack of self-confidence	3	0
		Lack of focus	2	0
		“Chato”	1	0
		Strict/not nice	1	0
		To nice/to optimistic	0	2
		Lack of assertiveness	0	1
		Demanding	0	2
Leadership skills				
PI tasks	Action Phase	Encourage team self-management	1	n.a.
		Monitor team	3	n.a.
		Perform team task	2	n.a.
		Provide resources	1	n.a.
		Solve problems	1	n.a.
		Support social climate	4	n.a.
	Transition Phase	Define mission	2	n.a.
		Establish expectations and goals	1	n.a.
		Train and develop team	4	n.a.
		Structure and plan	2	n.a.
	Specific tasks of PIs (not team related)	Time management	2	n.a.
		Multitasking	1	n.a.
		Networking	2	n.a.
		Plan the future (own career)	1	n.a.
		Funding management	2	n.a.
		Grant writing/Get funding	7	n.a.
		Administrative tasks	1	n.a.
		Creativity	2	n.a.
		Complementarity with GL	1	n.a.
		Publish articles/disseminate results	2	n.a.
		Collaboration with other teams /Multidisciplinarity	1	n.a.
		Project management	5	n.a.
	HR Management	Career guidance	2	n.a.
		Lead/Manage a group of people	4	n.a.

Strengths as leader	Action Phase	AP - Encourage team self-management	1	n.a.
		AP - Support social climate	4	n.a.
	Transition Phase	TP - Structure and plan	1	n.a.
		TP - Train and develop	1	n.a.
	Interpersonal skills	Lead by example	3	n.a.
		Communication	3	n.a.
		Engage/Motivate team members	3	n.a.
		Team work	1	n.a.
		Availability/ Accessible	4	n.a.
	Personal skills	Auto-efficacy	1	n.a.
		Creative	1	n.a.
		Sincerity	1	n.a.
		Motivation/Passion	3	n.a.
		Patience	1	n.a.
Grant writing		2	n.a.	
Balance demanding/flexible		1	n.a.	
To develop as leader	Leadership skills	TP - Structure and plan	1	0
		TP – Train and develop	0	3
		AP – Manage team boundaries	2	0
	Interpersonal skills	Motivate people	1	0
		Conflict management	3	0
	Personal skills	Assertiveness	1	0
		Auto-efficacy	2	0
		Time management	4	0
		Organization	1	0
		Planning	1	0
	PI tasks	Grant writing	1	0
		Funding management	2	0
		Keep up with the literature	1	0
		Public presentations	1	0
Good leader	Leadership skills	AP - Encourage team self-management	1	3
		AP - Support social climate	2	1
		AP - Performs team task	1	0
		AP - Manage team boundaries	1	0
		AP - Solve problems	0	1
		TP - Provide feedback	1	2
		TP - Monitor team	1	0
		TP - Define mission	2	0
		TP - Establish expectations and goals	2	0
		TP - Structure and plan	2	0

		TP - Train and develop	1	2
		Leads by example	2	0
Interpersonal processes		Adapt style to people	3	2
		Conflict management	1	0
		Motivates the team	4	2
		Career guidance	3	0
		Communication with the team	3	2
		Supportive	0	1
PI tasks		Funding management	1	0
		Grant writing/Get funding	2	0
		Keep up literature / Knowledge	3	0
		Networking	1	0
		Project management	1	0
Personal skills		Creative	1	0
		Passion about its work	1	0
		Patient	1	2
		Focus	1	0
		Time management	2	0
		Comprehensive	1	0
		Open mind	1	1
		Present	1	0
		Respectful	1	0
		“Human”	2	0
		Confident	0	1
		Available	0	1
		Rigorous/demanding	0	1
	Knowledge	0	2	
Lacks in most Leaders	Leadership skills	AP - Compose team	1	0
		TP - Establish expectations and goals	3	2
		AP - Support social climate	2	0
		AP - Encourage Team self-management	2	4
		AP: Solve problems	0	1
		TP - Define mission	1	0
		TP - Structure and plan	1	1
		TP: Train and develop team	0	4
Interpersonal processes		Interpersonal skills	4	1
		Conflict management	1	1
		Communication	0	1
		Consideration	1	0
Personal skills		Empathy	4	1

		Flexibility	2	0
		Humanity	3	0
		Assertiveness	1	2
		Passion	2	0
		Organization	1	0
		Open to share	0	1
		Availability	0	2
	PI tasks	Funding management	1	0
		Meetings productivity	1	0
Relationship Supervisor/Team members				
Most relationships	Heterogeneous	Heterogeneous	6	0
	Positive	AP - Encourage team self-management	1	n.a.
		AP - Support social climate	1	n.a.
		AP - Perform team task	1	n.a.
		TP - Train and develop team	2	n.a.
		TP - Provide feedback	1	n.a.
		Adapt style to people	2	n.a.
		Communication	3	n.a.
		Team work	2	n.a.
		Lead by example	1	n.a.
		Relaxed	1	n.a.
	Friendship /respect/ Proximity	6	n.a.	
	Negative	Authoritarianism	5	n.a.
		Bad environment	3	n.a.
		Lack of guidance	3	n.a.
Bad/lack communication		5	n.a.	
Gender issues		1	n.a.	
Lack of ethical knowledge		1	n.a.	
Leadership training				
Themes to address	Leadership skills	AP - Perform team task	1	0
		AP - Solve problems	1	1
		AP - Support social climate	1	1
		TP - Establish expectations and goals	3	1
		TP - Provide feedback	1	0
		TP - Define mission	1	0
		HR/Team management	4	0
		TP - Train and develop	1	2
		TP - Structure and plan	0	3
	Interpersonal Processes	Conflict management	3	2
		Motivate the team	4	1

		Communication	1	1
		Adapt style to people	4	4
Personal skills		Time management	4	2
		Personal development	1	0
PI tasks		Manage financial resources	1	1
		Write projects	0	1
		Lab manual	0	4
		Project management	2	0
		Get funding	1	0
		Knowledge	4	0
Useless to address		Compare research to a company	-	1
		Emotional Intelligence	-	1
		Nothing	-	7
		Specific rules (schedules,...)	-	1
Disadvantages		None	-	6
		Only if imposed	-	1
Attended	-	-	3	n.a.
Never attended	-	-	7	n.a.

Table 11*Interviews and Focus Groups Summary Table with examples*

Theme	Topic	Supervisors	Team members
Desired competencies	Encourage team self-management	“Leave some freedom to the team, controlled freedom, but you can let the team try things (...) let the creativity of the team flow but at the same time keeping the focus...” - Leader 4	“They also allowed me to be quite autonomous and (...) I think this is a very important feature for a PI.” - Team member 5
	Manage team boundaries	“He [the PI] is the one who gives his face for the project, it’s him who gives his face for the group’s results” - Leader 4	-
	Performs team task	“[The PI] doesn't put himself above the team and knows how to... create unity (...). Of course he’s in charge, but deep down we're all in this together” - Leader 2	-
	Provide feedback	“Telling when someone is not doing enough or not achieving what they want to do” - Leader 10	“I also think that feedback is super important” - Team member 1
	Support social climate	“[A good leader should be] attentive to the other, careful with the other (...)” - Leader 5	“I think a characteristic of a leader is, without a doubt, creating a good environment and creating good relationships with people.” - Team member 7
	Monitor team	“The micromanagement part can be very important, especially when we are talking about students, whether the student is doing enough or not to complete a thesis (...)” - Leader 1	-
	Define mission	“Should know the direction, where they [the team] are going” - Leader 2	-
	Establish expectations and goals	“It is also important to help the student to set goals” - Leader 9	-
	Structure and plan	“I think [a PI] is a person who knows how to manage his group very well, who knows what people are capable of doing (...) and delegate to each one” - Leader 3	-
	Solve problems	-	“I get there one day and say “Look, I made a mistake here, what now?” and the person has to say “ok, this happened and now do it like this or do like that” - Team member 3
Train and develop	“Because if I manage to extract the best from others, it will be good for me because the project will advance, it will be good for the student because he will develop scientific and personal skills” - Leader 7	“(…) getting the perception, over time, of what the student is capable of and what the student is worth in terms of researcher, and push for these characteristics.” - Team member 11	
Adapt style to people	“It’s important to be able to see how each individual... because what I may respect, somebody else may not” - Leader 10	“I would perhaps point to the ability and flexibility to adapt to the student, (...) because the standard does not fit all students” - Team member 11	

	Conflict management	“You have to be a good conflict manager, as I've mentioned before” - Leader 1	-
	Motivate the team	“When you wake up in the morning and (...) you are motivated to do it because you know that you are welcomed there and your work is valued, (...), so if you are happy will do a better job” - Leader 6	-
	Career guidance	“I think that a leader has an obligation to ultimately be able to advise him or her in their professional decisions” - Leader 9	-
	Communication with the team	“[A leader is someone] who listens to the other and gives them the opportunity to share their idea, no matter how messed up or outdated it may be” - Leader 5	“I would just add good communication, that is, knowing how to communicate with students” - Team member 10
Shown competencies	Encourage team self-management	“I give a lot of independence” - Leader 9	“As I began to understand how the protocols worked, she gave me more autonomy” - Team member 4
	Support social climate	“I'm attentive to the work but also to this thing of the feelings and emotions of the people I work with” - Leader 5	“We have arguments where she doesn't want me to come to work so many hours and not the opposite... (laughs)” - Team member 7
	Structure and plan	“Define exactly the work that each one has to do without being too authoritarian” - Leader 2	“I had to have everything programmed to the millimeter for 3 or 4 weeks ahead, and that made it possible to have a perspective of what is possible to do in the time we have” - - Team member 11
	Train and develop team	“I think it's the ability to explain things, that is, not simply passing a protocol into a person's hands” - Leader 1	“They even encouraged me to go to conferences, to even go abroad” - Team member 2
	Communication	“I think I have some quality in terms of communication, of being able to communicate with the person” - Leader 8	-
	Motivate the team	“And trying to encourage them when things aren't working because that's probably the most difficult times...” - Leader 10	-
	Monitor team	-	“One of them is always on top, she knows everything I have, everything right, she knows my thesis from top to bottom” - Team member 8
	Solve problems	-	“[The PI] comes always with suggestions of what might be going wrong and ways to fix it.”- Team member 10
	Challenge team	-	“Instead of saying “look, now you do this”, they always wanted to (...) discuss with me why it was like that, or what I thought and know what was my opinion, the decisions I wanted to make...” - Team member 3

	Provides feedback	-	“She corrects me a lot” - Team member 1
	Define mission	-	“[with this PI] I feel that we are all working towards a common goal” - Team member 5
	Establish expectations and goals	-	“I think that, from the start, those first meetings in which you realize what they do and how is what allows for a good relationship afterwards, because if there are no misunderstandings from what is going to be expected from us, there will be no misunderstandings in the end because we know exactly where we belong and what work we have to do” - Team member 11
Competencies to develop	Manage team boundaries	-	“In order for me to be able to lead my team as well, I also have to be able to deal better with the leadership above me, and sometimes that's also a little bit difficult” - Leader 2
	Structure and plan	-	“(…) management of… what needs to be done, (…) I have many problems with managing goals and deadlines” - Leader 4
	Conflict management	-	“I think it’s even at the level of conflict resolution. I think it’s a part that fails a bit (…)” - Leader 2
	Motivate the team	-	“How do you get a bunch of people to be as enthusiastic about this work as you are (…)” - Leader 10
	Train and develop team	-	“I think it’s important to change the point of view from seeing the student as a workforce to seeing the student as an opportunity to teach someone” - Team member 1
Competencies lacking	Compose team	-	“Both the interviews and the selection processes, it’s a point that needs to be better explored” - Leader 4
	Support social climate	-	“And also a great effort so that there is a good environment in the laboratory” - Leader 3
	Encourage Team self-management	-	“[The supervisor] must be able to guide him [the student] and not sending him to do things, because the person has to discover some things for himself and not basically being told everything,” - Team member 1
	Solve problems	-	“When they don’t know how to do something they should say “I don’t know either, let’s try to find out” - Team member 3
	Define mission	-	“I think you get much better results (….) when everybody has a common goal and really wants to work towards it, but that is very difficult to actually make happen, I find…” - Leader 10

Structure and plan	“So, it’s having people working on projects in a way that makes sense and maximizes the output for the person and the lab.” - Leader 3	“I think it’s lacking a certain preparation, so getting to know what skills the person already has and taking that in favor of the project” - Team member 5
Train and develop team	-	“It’s easier, it’s easier to do it himself [the supervisor] than to teach it, it’s faster.” - Team member 8
Establish expectations and goals	“I think most relationships fail due to wrong expectations on both sides, (...) the expectation management is very important” - Leader 4	“(…) if a student doesn't say he wants to do something, maybe he doesn't know he has that right, maybe he’s just waiting to be asked to do it because he doesn't know he can say he wants to” - Team member 11
Communication	-	“Sometimes, bad communication” - Team member 7
Conflict management	“And once again, conflict management is important” - Leader 3	“Sometimes there is bad leadership from the PI’s side, because they do not solve conflicts between people from their laboratory” - Team member 7

Appendix VIII

Correlation Matrix

Table 12

Correlation matrix of all variables related to Leadership tasks

Variable (Leadership task)	1	2	3	4	5	6	7	8	9	10	11
Transition Phase											
1. Establish expectations and goals	1	0.689**	0.725**	0.371*	0.256	0.634**	0.359*	0.511**	0.217	0.204	-0.016
2. Train and develop	-	1	0.676**	0.342*	0.280	0.887**	0.538**	0.821**	0.068	0.302	0.044
3. Provide feedback	-	-	1	0.386*	0.237	0.661	0.264	0.575*	-0.025	0.138	-0.063
4. Define mission	-	-	-	1	0.637**	0.155	0.324	0.250	0.294	0.248	0.025
5. Structure and plan	-	-	-	-	1	0.186	0.148	0.274	0.550**	0.442*	0.237
Action Phase											
6. Solve problems	-	-	-	-	-	1	0.554**	0.845**	0.072	0.437**	0.118
7. Encourage team self-management	-	-	-	-	-	-	1	0.478**	0.266	0.324	0.087
8. Support social climate	-	-	-	-	-	-	-	1	0.071	0.354*	0.174
9. Monitor team	-	-	-	-	-	-	-	-	1	0.355*	0.188
10. Challenge team	-	-	-	-	-	-	-	-	-	1	0.258
11. Perform team task	-	-	-	-	-	-	-	-	-	-	1

* Significant correlation at the 0.05 level.

** Significant correlation at the 0.01 level.

Appendix IX

Pedagogical Intervention Proposal

1. Course title

Elevate your Leadership: Essential Skills for Post-Docs

2. Course framework

The research environment is highly demanding, and Principal Investigators (PIs) are crucial for keeping teams motivated, focused, and supporting individual development. However, the competencies PIs develop are mainly science-related, and funding organizations prioritize scientific performance and work experience over leadership skills when evaluating PIs. As a result, there is a significant training gap in leadership and management skills, which can lead to project failure and compromise future funding. It is essential to fill this gap to ensure PIs can effectively manage and support their team members and promote a positive team culture. This customized training program aims to help PIs in Life and Health Sciences improve their leadership strategies and practices towards a more effective team performance.

3. Thematic area

According to the National Classification of Training Areas (*portaria 256/2005 de 16 de março*), this training course is part of the thematic areas nr 090 (Personal development) and nr 345 (Management and Administration).

4. Training modality

This is training to improve skills and fits into the type of continuous professional training.

5. Target population

Post-Docs that are responsible for supervising team members and aim to pursue a leadership role in Science.

6. Course duration

15 synchronous hours.

7. General and specific goals

General goals:

Trainees must be able to:

- Recognize the importance of the Leader on team effectiveness;
- Know how to establish expectations and goals;
- Apply time management tools when planning and structuring tasks;
- Recognize the importance of training and developing team members;
- Understand the impact of motivation on work performance;
- Deal with conflicts.

Specific goals:

Trainees must be able to:

- Understand the different aspects that compose functional leadership;
- Use the SMART framework to set up goals;
- Apply effective time management techniques on task planning;
- Conduct effective group meetings and one-on-one sessions;
- Understand some of the key factors that drive motivation;
- Adapt their approach style when dealing with different personalities;
- Identify the most common approaches to deal with conflicts;
- Use different conflict resolution tools.

8. Program contents

Table 13

Contents and duration of each Module of the training proposal

Module	Contents	Duration
I – Setting the foundation for effective Leadership: Defining goals and expectations	✓ Concept of Leadership	210 min
	✓ The importance of setting clear goals and expectations	
	✓ SMART framework	
II – Structuring for Success: Planning work and training your team	✓ Time management	225 min
	✓ The importance of group meetings	
	✓ One-on-one coaching	
	✓ Types and benefits of training	

III – Empowering your team to succeed	<ul style="list-style-type: none"> ✓ Motivation theories ✓ The importance of knowing team members ✓ DiSC assessment and how to read it 	225 min
IV – Navigating Conflict in the Workplace	<ul style="list-style-type: none"> ✓ Sources and impacts of Conflicts ✓ The role of the leader in conflict management ✓ Conflict resolution approaches and tools 	240 min

9. Trainer’s profile

Trainers must:

- Have the Pedagogical Skills Certificate (CCP);
- Have experience or knowledge on Leadership training;
- Have a degree, preferably, in the area of Human Resources Management;
- Have training in the application and interpretation of the DiSC assessment;
- Be familiar with the context of the target group, for example, by having worked in a Research Institute.

10. Pedagogical methods and techniques

Table 14

Pedagogical Methods and Techniques used in each Module

Module	Methods	Techniques
I – Setting the foundation for effective Leadership: Defining goals and expectations	<ul style="list-style-type: none"> ✓ Active Method ✓ Expository Method ✓ Interrogative Method ✓ Demonstrative Method ✓ Active Method 	<ul style="list-style-type: none"> ✓ Ice breaker ✓ Exposure ✓ Brainstorming ✓ Group dynamics
II – Structuring for Success: Planning work and training your team	<ul style="list-style-type: none"> ✓ Active Method ✓ Expository Method ✓ Interrogative Method ✓ Demonstrative Method ✓ Active Method 	<ul style="list-style-type: none"> ✓ Ice breaker ✓ Exposure ✓ Brainstorming ✓ Role play

III – Empowering your team to succeed	✓ Active Method	✓ Ice breaker
	✓ Expository Method	✓ Exposure
	✓ Interrogative Method	✓ Brainstorming
	✓ Demonstrative Method	✓ Group dynamics
	✓ Active Method	
IV – Navigating Conflict in the Workplace	✓ Active Method	✓ Ice breaker
	✓ Expository Method	✓ Exposure
	✓ Interrogative Method	✓ Brainstorming
	✓ Demonstrative Method	✓ Group dynamics
	✓ Active Method	

11. Educational resources

The educational resources required for this Training are the following:

- Computer;
- PowerPoint;
- Internet connection;
- Projector;
- White Screen for Projection;
- Notepad;
- Pens;
- Whiteboard with appropriate pens;
- Training manual with a summary of the subjects covered;
- Recommended book for consultation;
- Learning and training evaluation sheets.

12. Training and learning evaluation

The evaluation of the training will be done in two moments: during and at the end of each Module. At the end of each module, a short closed-answer test will be conducted on Google Forms, about the session contents (10%+10%+10%+10%). This continuous evaluation aims to evaluate the trainees' understanding of the session's contents, and to identify any learning difficulties. In this way, the trainer will be able to provide immediate and continuous support to the trainee, facilitating his/her continuous learning development.

As the sessions have a very practical nature, the learning evaluation will also be carried out through observation sheets, with criteria related to the mastery of the subjects (Module I and

III) or the trainee's attitudes during the course of the activities (Modules II and IV) (15%+15%+15%+15%).

For each instrument, numerical rating scales will be used (0-20), which in the end will be translated into a descriptive scale (0-4: Insufficient; 5-8: Insufficient; 9-12: Sufficient; 13-16: Good; 17-20: Very good).

Finally, at the end of the training program, trainees will be asked to provide feedback on the training and the trainers, along with suggestions for improvement

13. Implementation conditions

To implement this training, it is required:

- Minimum number of 10 participants;
- Maximum number of 20 participants;
- Room with space for 20 people provided by the Institute;
- Chairs with paddles (enough for the number of participants);
- Room with projector and projection screen;
- Wi-Fi network for internet access is desirable.

14. Training regime

The training will be carried out On-site, at working hours or after working hours.

15. Budget estimate

Table 15

Budget estimate for the proposed training

Description	Unit Value	Total (min.)	Total (max.)
Trainee Fees	35 € / hour	525 €	525 €
Venue	0 € / hour*	0 €*	0 €*
Materials (printing of manuals, pens, notebooks)	10 €	100 €	200 €
Training advertisement (posters)	10 €	10 €	10 €
Total expenses		635 €*	735 €*
Revenues	100 € / Trainee*	1 000 €*	2 000 €*
Profit margin		365 €*	1 265 €*

* If the space is provided by the Institute

Appendix X

Training Session Plans

SESSION PLAN 1

Training Course: Elevate your Leadership: Essential Skills for Post-Docs			
Topic: Module 1 – Setting the foundation for effective Leadership: Defining goals and expectations			
Target Population: Post-Docs.			
Prerequisites:			
<u>Mandatory:</u>			
<ul style="list-style-type: none"> - Hold a Post-Doc position or similar; - In charge of supervising other team members; 			
<u>Preferential:</u>			
<ul style="list-style-type: none"> - Researchers that have or have had their own financed projects; - Work in the area of Life and Health Sciences. 			
Date: __/__/____	Duration: 210 min	Local: _____	Trainer: _____

Goals	
General goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Understand the concept of Leadership; • Recognize the structuring role of establishing expectations and goals to team members.
Specific goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Understand the different aspects that compose functional leadership; • Recognize the importance of establishing clear expectations and goal to team members; • Use the SMART framework to set up goals.

Phases	Program Contents	Methods and techniques	Resources	Evaluation Methodologies	Time
INTRODUCTION	Ice breaker (2 min pitch presentation of all participants)	Active Method (Ice breaker)	<ul style="list-style-type: none"> • Computer • Projector • Slides 	n.a.	30 minutes
	Introduction to the Training course and Module 1	Expository Method (Exposure technique)			10 minutes
DEVELOPMENT	What is leadership?	Expository Method (Exposure technique)	<ul style="list-style-type: none"> • Computer • Projector • Slides • White board • Markers 	n.a.	20 minutes
	Discussion: The main tasks of leadership	Interrogative Method (Brainstorming)			30 minutes
	Coffee Break				15 min

DESENVOLVIMENTO (cont)	Why it is important to be clear from the beginning? Team effectiveness and a kit to start (Lab Manual)	Expository Method (Exposure technique)			30 minutes
	Introduce the SMART framework for goal-setting*	Demonstrative Method*	<ul style="list-style-type: none"> • Computer • Projector • Slides • SMART worksheet 	The SMART worksheet will be considered for evaluation	15 minutes
	Set real SMART goals (Practical exercise in small groups)	Active Method (Group dynamics)			30 minutes
CONCLUSION	Summary and Closing Questions Assessment of learning and training	Expository Method (Exposure technique) Interrogative Method (Brainstorming)	<ul style="list-style-type: none"> • Computer • Projector • Slides • Internet access 	Training evaluation questionnaire and small questionnaire for the obtained knowledge (Google forms)	30 minutes

* Content details can be found on Appendix XI

SESSION PLAN 2

Training Course: Elevate your Leadership: Essential Skills for Post-Docs			
Topic: Module 2 – Structuring for Success: Planning work and training your team			
Target Population: Post-Docs.			
Prerequisites: <u>Mandatory:</u> <ul style="list-style-type: none"> - Hold a Post-Doc position or similar; - In charge of supervising other team members; <u>Preferential:</u> <ul style="list-style-type: none"> - Researchers that have or have had their own financed projects; Work in the area of Life and Health Sciences.			
Date: __/__/____	Duration: 225 min	Local: _____	Trainer: _____

Goals	
General goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Identify time management components; • Understand the importance of structuring and planning own work; • Recognize the importance of training and developing team members to enhance their skills and performance
Specific goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Know how to prioritize tasks; • Apply techniques to effectively structure and plan own work; • Recognize the importance of group meetings for team effectiveness; • Know how to conduct effective one-on-one sessions; • Identify different types of training and its benefits.

Phases	Program Contents	Methods and techniques	Resources	Evaluation Methodologies	Time
INTRODUCTION	Ice breaker ("Step into My Shoes")*	Active Method (Ice breaker)*	<ul style="list-style-type: none"> • Computer • Projector • Slides 	n.a.	20 minutes
	Introduction to Module 2: Structuring for Success	Expository Method (Exposure technique)			10 minutes
DEVELOPMENT	Time management (Prioritization, Planning and scheduling)	Expository Method (Exposure technique)	<ul style="list-style-type: none"> • Computer • Projector • Slides • White board • Markers • Pens • Task planning worksheets 	n.a.	20 minutes
	Discussion: Tools for time management (software, task lists, calendar apps).	Interrogative Method (Brainstorming)			10 minutes
	Hands on: Plan a task*	Active Method (Individual dynamic)*			25 minutes

	Coffee Break				15 minutes
DESENVOLVIMENTO (cont)	The importance of group meetings	Expository Method (Exposure technique)			10 minutes
	One-on-one coaching: the tool	Expository Method (Exposure technique)	<ul style="list-style-type: none"> • Computer • Projector • Slides • One-on-one coaching worksheet 	<p style="text-align: center;">Observation worksheet (for the One-on-one role play)</p>	20 minutes
	One-on-one role play (Practical exercise in small groups)	Active Method (Role play)			30 minutes
	Types and benefits of training	Expository Method (Exposure technique)			30 minutes
CONCLUSION	Summary and Closing	Expository Method (Exposure technique)	<ul style="list-style-type: none"> • Computer • Projector • Slides • Internet access 	<p style="text-align: center;">Training evaluation questionnaire and small questionnaire for the obtained knowledge (Google forms)</p>	30 minutes
	Questions	Interrogative Method (Brainstorming)			
	Assessment of learning and training				

* Content details can be found on Appendix XI

SESSION PLAN 3

Training Course: Elevate your Leadership: Essential Skills for Post-Docs			
Topic: Module 3 – Empowering your team to succeed			
Target Population: Post-Docs.			
Prerequisites: <u>Mandatory:</u> <ul style="list-style-type: none"> - Hold a Post-Doc position or similar; - In charge of supervising other team members; <u>Preferential:</u> <ul style="list-style-type: none"> - Researchers that have or have had their own financed projects; Work in the area of Life and Health Sciences.			
Date: __/__/____	Duration: 225 min	Local: _____	Trainer: _____

Goals	
General goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Define motivation; • Understand the importance of motivation on work performance; • Recognize the relevance of adapting the leadership style to different personalities.
Specific goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Understand some of the key factors that drive motivation; • Recognize the impact of motivation on the team’s performance; • Recognize different personalities; • Identify individual motivations of team members; • Acknowledge the importance of adapting the leadership approach to each personality.

Phases	Program Contents	Methods and techniques	Resources	Evaluation Methodologies	Time
INTRODUCTION	Ice breaker (Two Truths and a Lie)*	Active Method (Ice breaker)*	<ul style="list-style-type: none"> • Computer • Projector • Slides 	n.a.	20 minutes
	Introduction to Module 3: Empowering your team to succeed	Expository Method (Exposure technique)			10 minutes
DEVELOPMENT	Debate: What drives and affects motivation?	Interrogative method (Brainstorming)	<ul style="list-style-type: none"> • Computer • Projector • Slides • White board • Markers 	n.a.	20 minutes
	Motivation theories (Self-Determination Theory)	Expository Method (Exposure technique)			35 minutes
	Coffee Break				15 minutes

DESENVOLVIMENTO (cont)	The importance of knowing your team members (introverts vs extroverts, interests, career goals, work patterns)	Expository Method (Exposure technique)			30 minutes
	Every personality has its melting point: Adapt your leadership style (with DiSC assessment)	Demonstrative Method	<ul style="list-style-type: none"> • Computer • Projector • Slides • Case studies on paper 	Motivation plan (from the Motivation challenge)	30 minutes
	Motivation challenge (discussion in small groups)	Active Method (Group dynamics)			35 minutes
CONCLUSION	<p>Summary and Closing</p> <p>Questions</p> <p>Assessment of learning and training</p>	<p>Expository Method (Exposure technique)</p> <p>Interrogative method (Brainstorming)</p>	<ul style="list-style-type: none"> • Computer • Projector • Slides • Internet access 	<p>Training evaluation questionnaire and small questionnaire for the obtained knowledge (Google forms)</p>	30 minutes

* Content details can be found on Appendix XI

SESSION PLAN 4

Training Course: Elevate your Leadership: Essential Skills for Post-Docs			
Topic: Module 4 – Navigating Conflict in the Workplace			
Target Population: Post-Docs.			
Prerequisites: <u>Mandatory:</u> <ul style="list-style-type: none"> - Hold a Post-Doc position or similar; - In charge of supervising other team members; <u>Preferential:</u> <ul style="list-style-type: none"> - Researchers that have or have had their own financed projects; Work in the area of Life and Health Sciences.			
Date: __/__/____	Duration: 240 min	Local: _____	Trainer: _____

Goals	
General goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Define what a conflict is; • Recognize the main tools to effectively manage and resolve conflicts within the team.
Specific goals	<u>Trainees must be able to:</u> <ul style="list-style-type: none"> • Understand the different types and sources of conflicts; • Recognize the impact of conflicts on the team dynamics; • Understand the leader’s role in conflict management within the team; • Identify the most common approaches to deal with conflicts; • Enumerate different conflict resolution tools; • Recognize the best approach to deal with each conflict.

Phases	Program Contents	Methods and techniques	Resources	Evaluation Methodologies	Time
INTRODUCTION	Ice breaker (Research stories – share a research challenge and how you overcome)	Active Method (Ice breaker)	<ul style="list-style-type: none"> • Computer • Projector • Slides 	n.a.	15 minutes
	Introduction to Module 4: Navigating Conflict in the Workplace	Expository Method (Exposure technique)			10 minutes
DEVELOPMENT	Conflicts: sources and impacts	Expository Method (Exposure technique)	<ul style="list-style-type: none"> • Computer • Projector • Slides • White board • Markers 	n.a.	15 minutes
	Discussion: The role of the leader in conflict management	Interrogative method (Brainstorming)			45 minutes
	Coffee Break				15 minutes

DESENVOLVIMENTO (cont)	The 5 approaches to Conflict management (Avoiding, Competing, Accommodating, Compromising and Collaborating)	Expository Method (Exposure technique)			20 minutes
	Case study: one conflict case with different approaches	Active Method (Group dynamics)			40 minutes
	Examples of common conflicts and how to manage them	Demonstrative Method	<ul style="list-style-type: none"> • Computer • Projector • Slides • Case studies on paper 	Observation worksheet (for the Case study)	15 minutes
	Building bridges: how team building activities foster communication, trust, and prevent conflicts	Expository Method (Exposure technique)			15 minutes
	Team-building activity (“The Human Knot”)*	Active Method (Group dynamics)*			20 minutes
CONCLUSION	<p>Summary and Closing</p> <p>Questions</p> <p>Assessment of learning and training</p>	<p>Expository Method (Exposure technique)</p> <p>Interrogative method (Brainstorming)</p>	<ul style="list-style-type: none"> • Computer • Projector • Slides • Internet access 	Training evaluation questionnaire and small questionnaire for the obtained knowledge (Google forms)	30 minutes

* Content details can be found on Appendix XI

Appendix XI

Training materials examples

XI.1. Ice breaker activities

“Step into My Shoes” (Session 2)

Instructions:

1. Divide participants into pairs or small groups.
2. Each participant should take turns sharing a personal experience or story that they feel has shaped their perspective or personality.
3. After one person shares, the other person should reflect on what they heard and try to imagine what it might be like to “step into their shoes”. They can ask questions or share their own related experience if they have one.
4. After both people have had a chance to share, the pairs or small groups can come back together as a larger group and share some of the insights or takeaways they gained from the exercise.

Debriefing:

1. Ask participants how they felt about the activity and if they learned anything new or surprising about their partner(s).
2. Discuss any common themes or experiences that came up across the group.
3. Ask participants if they feel like the activity helped them better understand the perspectives of others, and if so, how they might apply this understanding in their personal or professional lives.

“Two Truths and a Lie” (Session 3)

Instructions:

1. Ask each participant to introduce themselves to the group.
2. Explain that each person will share three statements about themselves, two of which are true and one of which is a lie.
3. The other participants will try to guess which statement is the lie.
4. After everyone has shared their three statements, the group can discuss and share their thoughts on what they learned about each other.

XI.2. Demonstrative method

Introduce the SMART framework for goal-setting (Session 1) – Presentation plan

Slide 1: Introduction

Title: How to Achieve Your Goals Using the SMART Framework

Slide 2: What is the SMART Framework?

Title: Understanding the SMART Framework

Content: The SMART framework is a tool used to set and achieve goals. It stands for Specific, Measurable, Achievable, Relevant, and Time-bound. The framework can be used for both personal and professional goals and helps individuals break down their goals into actionable steps.

Slide 3: Specific

Title: Being Specific

Content: The first step of the SMART framework is being specific. This means that your goal should be clear and concise. For example, instead of setting a goal to “get in shape,” a more specific goal would be to “run a 5k in under 30 minutes.”

Slide 4: Measurable

Title: Making it Measurable

Content: The second step is making your goal measurable. This means setting a goal that can be tracked or measured in some way. Continuing with the previous example, tracking your progress by recording your running times or distance covered can make your goal measurable.

Slide 5: Achievable

Title: Ensuring it's Achievable

Content: The third step is ensuring that your goal is achievable. Setting a goal that is too difficult or unrealistic can lead to frustration and discouragement. For example, setting a goal to run a marathon without any prior running experience may not be achievable.

Slide 6: Relevant

Title: Making it Relevant

Content: The fourth step is making your goal relevant. This means that your goal should align with your values and priorities. For example, if your goal is to run a 5k in under 30 minutes, it should align with your values of health and fitness.

Slide 7: Time-bound

Title: Setting a Deadline

Content: The final step of the SMART framework is setting a deadline. This means setting a specific date or timeframe for when you want to achieve your goal. Setting a deadline creates a sense of urgency and helps individuals stay focused on their goal.

Slide 8: Example

Title: Putting it into Practice

Content: Let's put the SMART framework into practice with an example

Slide 9: Bad example (not Specific)

Content: “*Maria (a leader of a scientific team) wants to improve the team's performance.*”

Specific: Maria's goal is not specific since it does not define what “performance” means or what specific aspects of the team's work she wants to improve. It is unclear what specific actions she needs to take to achieve her goal.

Measurable: Without a specific goal, it is difficult to measure progress or determine when the goal has been achieved.

Achievable: Maria's goal may or may not be achievable, depending on what specific actions she takes and how she defines “performance”.

Relevant: Improving her team's performance is relevant to Maria's career goals as a scientific leader and the success of her research team.

Time-bound: There is no specific deadline or timeframe for achieving the goal since it is not specific.

I hope this example illustrates the importance of setting specific goals when using the SMART framework, to ensure that everyone is clear about what needs to be achieved and how progress will be measured.

Slide 10: Bad example (not Achievable or Time-bound)

Content: “*Maria (a leader of a scientific team) wants to increase the team’s productivity by 100% within the next quarter.*”

Specific: Maria’s goal is clear and concise - to increase her team’s productivity by 100% within the next quarter.

Measurable: Maria can measure her team’s productivity by tracking the number of completed experiments, research publications, or presentations within the next quarter.

Achievable: However, Maria’s goal is not achievable within the given timeframe, given the limitations of the team’s current workload and resources. It may require hiring additional staff or significant restructuring of current processes.

Relevant: Increasing her team’s productivity is relevant to Maria’s career goals as a scientific leader and the success of her research team.

Time-bound: Maria has set a deadline of the next quarter to achieve her goal of increasing her team’s productivity by 100%, which is not a realistic timeframe for such a significant increase.

I hope this example helps illustrate the importance of ensuring that goals are achievable and setting realistic timelines when using the SMART framework.

Slide 11: Bad example (not Measurable)

Content: “*Maria (a leader of a scientific team) wants to improve the team’s productivity within the next quarter.*”

Specific: Maria’s goal is clear and concise - to improve her team’s productivity within the next quarter.

Measurable: However, Maria’s goal is not measurable since it does not specify what “improving productivity” means or how it can be measured. It is unclear what criteria will be used to determine whether the goal has been achieved.

Achievable: Maria’s goal may or may not be achievable, depending on what specific actions she takes to improve her team’s productivity and how she measures it.

Relevant: Improving her team’s productivity is relevant to Maria’s career goals as a scientific leader and the success of her research team.

Time-bound: Maria has set a deadline of the next quarter to achieve her goal of improving her team’s productivity, but it is not clear what specific actions will be taken or how progress will be measured.

I hope this example illustrates the importance of setting specific and measurable goals when using the SMART framework, to ensure that progress can be tracked and achieved effectively.

Slide 12: the most correct example

Content: “*Maria (a leader of a scientific team) wants to increase the team’s productivity by 25% within the next quarter.*”

Specific: Maria’s goal is clear and concise - to increase her team’s productivity by 25% within the next quarter.

Measurable: Maria can measure her team’s productivity by tracking the number of completed experiments, research publications, or presentations within the next quarter.

Achievable: Maria’s goal is achievable based on the current workload and resources of her team, as well as potential opportunities to streamline processes or delegate tasks.

Relevant: Increasing her team’s productivity is relevant to Maria’s career goals as a scientific leader and the success of her research team.

Time-bound: Maria has set a deadline of the next quarter to achieve her goal of increasing her team’s productivity by 25%.

Slide 13: Conclusion

Title: Benefits of Using the SMART Framework

Content: Using the SMART framework can help individuals set and achieve their goals in a structured and effective manner. By breaking down goals into specific, measurable, achievable, relevant, and time-bound steps, individuals can create actionable plans and track their progress towards achieving their goals.

XI.3. Active methods

“Hands on: Plan a task” (Session 2)

Instructions:

1. Distribute a worksheet to each participant (model example can be seen on the next page).
2. Ask participants to take some time to review the worksheet and fill out each section with their ideas and plans for the task (they can take the SMART goal example they wrote on the previous Session as a starting point).
3. Once participants have completed their worksheets, ask them to pair up with another participant and share their worksheets with each other.
4. Encourage participants to ask each other questions about their plans and offer feedback and suggestions for improvement.
5. After each pair has had a chance to share and receive feedback, bring the group back together and ask for volunteers to share their worksheets with the whole group.
6. As each person shares, encourage the group to ask questions and offer constructive feedback.
7. At the end of the activity, ask the group to reflect on what they learned from the exercise and how they might apply these insights to their own work.

TASK PLANNING WORKSHEET

Task Description:

[Provide a brief description of the task to be planned]

Objectives:

[List the objectives that the task should achieve]

- 1.
- 2.
- 3.

Resources:

[List the personnel, materials, and equipment needed to complete the task]

- 1.
- 2.
- 3.

Obstacles and Contingencies:

[List potential challenges associated with the task and create contingency plans to address them]

Obstacle	Possible solution / workaround
1.	
2.	
3.	
4.	
5.	

Timeline:

[List the key milestones and deadlines for completing the task]

Milestone	Start Date	End Date
1.		
2.		
3.		
4.		
5.		

“The Human Knot” (Session 4) – Team-building activity

Instructions:

1. Ask all participants to stand in a circle facing inward and shoulder to shoulder.
2. Ask everyone to extend their right hand and grab the right hand of someone across from them, but not directly next to them. Then, have them extend their left hand and grab the left hand of someone else.
3. Participants will now be connected to two different people in the circle, but not directly next to them.
4. Instruct the group to untangle the knot they have created without releasing their hands. The end goal is for the group to end up standing in a circle without any crossed arms or hands.
5. Participants can communicate and strategize amongst themselves but cannot let go of each other’s hands.

The human knot activity helps to build teamwork, communication, and problem-solving skills. It requires participants to work together, communicate effectively, and think creatively to find a solution. The activity can also help to break down social barriers and promote collaboration within a group.