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Strategic Plan to mitigate physical demands: the case of Aquarists in Oceanário de Lisboa

Constança Gomes da Cruz Dias Gonçalves

Project submitted for the degree of Master in Human Resources Management and Organizational Consultancy

Supervisor:
PhD Sara L. Lopes. Invited Assistant Professor
Department of Human Resources and
Organizational Behavior
ISCTE-IUL

October, 2024

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Segue o teu destino,

Rega as tuas plantas,

Ama as tuas rosas.

O resto é a sombra

De árvores alheias.

Fernando Pessoa

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Acknowledgments

To my parents, Carla and Carlos, my sister Carolina, my brother Caetano, thank you for being my biggest supporters, safe place and for believing in me.

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Resumo

Os aquaristas que trabalham no Oceanário de Lisboa enfrentam vários desafios para o desempenho eficiente das suas funções. Este projeto dedica-se a apresentar e propor algumas estratégias que possam reduzir a fadiga física e mental no seu trabalho. Será dada particular atenção aos aspetos físicos do trabalho que um aquarista desempenha na manutenção de habitats aquáticos e de mergulho, no tratamento dos animais, enquanto são criadas soluções que contribuam para o bem-estar dos trabalhadores e para a operação. Neste estudo qualitativo foram entrevistados profissionais do Oceanário de Lisboa de forma a compreender os principais desafios que influenciam o desgaste físico e os stressores que afetam a sua saúde mental. Os resultados apontam para a importância do reforço e tratamento físico, conceção ergonómica do posto de trabalho, da rotação de tarefas, da flexibilidade de horários e do apoio psicológico. As estratégias propostas visam a sustentabilidade do ambiente de trabalho nestas áreas, podendo, por isso, servir de modelo para os aquários em todo o mundo.

Palavras-chave: Aquaristas, Aquário, Fadiga Física, Stressores Mentais, Ergonomia

Classificação JEL: O15 – Human Resources; J81 – Working Conditions

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Abstract

Aquarists working in the world-renowned Oceanário de Lisboa face a lot of challenges with regard to efficient performance of their duties. This project is dedicated to discussing and proposing some strategies that could potentially reduce physical and mental fatigue at work. Particular attention will be given to the physically demanding aspects of the job that an aquarist performs in maintaining aquatic habitats and diving, and in caring for the animals, while creating solutions that contribute to employee well-being and operational excellence. This qualitative study interviewed professionals at Oceanário de Lisboa about the main challenges that influence physical strain and the stressors affecting their mental health. These findings point out the importance to the importance of strengthening and physical treatment, the designing of the workplace ergonomically, rotation of tasks, flexible working hours, and providing psychological support. The proposed strategies target the sustainability of the work environment by addressing these areas and could, therefore, possibly serve as a model for aquariums worldwide.

Keywords: Aquarists, Aquarium, Physical Fatigue, Mental Stressors, Ergonomics

JEL Classification: O15 – Human Resources; J81 – Working Conditions

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Glossary

COR - Conservation of Resources

FSS - Fatigue Severity Scale

GHQ - General Health Questionnaire

JD-R - Job Demands-Resources

MAAS - Mindfulness Attention Awareness Scale

MBI - Maslach Burnout Inventory

MSBs - Musculoskeletal Disorders

NMQ - Nordic Musculoskeletal Questionnaire

PSQI - Pittsburgh Sleep Quality Index

REBA - Rapid Entire Body Assessment

RSIs - Repetitive Strain Injuries

RULA - Rapid Upper Limb Assessment

SwAge - Sustainable Working Life for All Ages

SWLT - Sustainable Working Life Theory

UWES - Utrecht Work Engagement Scale

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Introduction

Human Resources are important in any organization, playing a crucial role in terms of support and development of teams to make sure they are prepared to perform their duties effectively. The major scope of Human Resources operation usually entails human talent recruitment and retention, career path development, welfare management of workers, and succession planning. These activities shall be paramount not only for the continuity of operating the business but also in promoting the growth and innovation of the teams (Mahapatro, 2021).

Among the main concerns of Human Resources departments, their foremost responsibilities encompass providing appropriate working conditions, safety, and welfare of the workers, both physically and mentally, while managing a motivated and resistant team (Armstrong & Taylor, 2023; Dessler, 2013). Within work contexts where the tasks require, on occasion, high physical demands coupled with a high degree of technical specialization, Human Resources must create conditions and put into practice policies and programs aimed at decreasing the physical and psychic burden of workers. The emphasis on working conditions comes mainly in those sectors where tasks are physically demanding, routines complex, requiring support plans which will ensure the long-term safety, health, and satisfaction of the employees (Gebhardt & Baker, 2023).

These pressures are felt far more within aquatic settings, given the specialized nature of knowledge and physical demands of maintaining a living ecosystem. A case where such strategies have been in effective application is Oceanário de Lisboa, whose practices are comprehensive, ranging from continuous training to investment in retaining specialized talent to strategies of well-being for physically demanding jobs.

Oceanário de Lisboa is one of the capitals must-visit attractions. Opened in 1998 as part of the 20th century's Last world exhibition, Expo'98, Oceanário is a global beacon for ocean conservation, enjoyment, and blue literacy. Its mission is clear: "Promoting knowledge of the ocean, making citizens in general aware of their duty to conserve our natural heritage by changing their behaviour". Oceano Azul Foundation is Oceanário shareholder, and their mission is to actively contribute to a healthy ocean by acting in three axes: the management of an excellent exhibition, the promotion of blue literacy and ocean conservation. Oceanário de Lisboa and Fundação Oceano Azul work together to achieve a common goal: to save the ocean that binds us all.

Oceanário de Lisboa runs several businesses in different industries: its core is the exhibition, a large facility that comprises several aquariums and habitats of living marine

species. The focus of the other area are public visitation, retail, sustainable merchandising, education, development of conservation-oriented tourism products, commercialization of nature experiences in cooperation with other entities, and supplying education programs by third-party entities. However, the exhibition is the core and most highlighted product of Oceanário. This particular mix of activities places Oceanário in a niche within the marketplace.

As outlined above, Oceanário can be termed as a niche company. This categorization underlines the importance of the knowledge held by its staff, especially within the Biology and Conservation department. The knowledge and capabilities cannot be bought from the market, since it cannot be found, and require lots of time and investment by the organization for their development. It is, therefore, of great essence that the Human Resources department develops a medium and long-term strategy to retain. Identification of the focal area is very important to retain and develop skills and talent in order to maintain high standards of quality.

Focusing on the core business area, the exceptional exhibition of live animals, specialized knowledge becomes the top priority. It plays a crucial role in managing the living collection, running, and maintaining life support systems, designing, and producing new displays, and carrying out species conservation work. This consolidated competence explains the fact that aquariums continued to exist, especially those with the dimension and importance of the ones in Oceanário de Lisboa. Another key competence area is education. Communicating efficiently at the exhibition, either through non-formal educational programs or pure communication via social networks and other channels, requires a lot of investment and cannot be bought on the spot. Hence, a common issue of retention and developing expertise, as well as all other organizational issues, cut across.

In Oceanário de Lisboa, in the Biology and Conservation department exists a technical role that, in addition to requiring relevant knowledge, is also a physically exhausting job, - the aquarists. These technicians are responsible for preparing the food and medication for the marine life, feeding the animals, doing observations, and the heavier tasks of cleaning and maintaining tanks and habitats. Particularly relevant, the latter duty burdens the individuals concerned a lot in terms of physical and psychological demands and assumes a great part of their worktime.

The total number of aquarists in this department is 25, out of which eight are serving in this capacity for more than 15 years and have crossed the age barrier of 40-plus years. This long period of service in a physically demanding job caused physical injuries due to which some employees are looking for internal mobility options as they find it difficult to cope up with challenges.

From a Human Resources perspective, the approach to this situation must entail planning strategies that can help facilitate employees in moving ahead for their personal and professional growth. The general challenges are (Pritchard, McChesney & Bichsel, 2019):

- Employee satisfaction.
- Physical and psychological fitness of the employees.
- Career and succession planning.
- Talent loss within the team and the overall organization.

At this point in time, and also due to the small size of the teams, there is limited opportunity for internal career advancement. The solution to this issue is of utmost significance but has proved highly hard so far. The knowledge transfer that is so crucial can also be very difficult to maintain whenever someone leaves or there is any other form of mobility.

In addition, with increasing awareness that these technical roles within the department are physically demanding and exhaustive, career development pathways must be developed while exploring innovative methods for transferring such invaluable expertise to other areas (Pritchard, McChesney & Bichsel, 2019). This must include strategies aimed at mitigating the impact of physical strain and aging on the aquarists.

In this sense, this project seeks to plan strategies that mitigate the physical demands of the role and the influence of aging in the aquarists of Oceanário de Lisboa. This will also not be specifically planned for implementation within the organization but could serve as a possible model for other aquariums when called upon.

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Definition of the problem

Aquarists in Oceanário de Lisboa are at the forefront of marine life conservation and management. Performing such physical and mentally demanding tasks should relate directly to their well-being and long-term performance (Ilies, Dimotakis & De Pater, 2010). On a daily scale, aquarists conduct work that is characterized by great challenges regarding their health, physical and mental, motivation, and job satisfaction. In their work, many physical activities are entailed, such as the maintenance of tanks, diving, and manipulating massive equipment. Hence, these employees are greatly exposed to musculoskeletal injuries and chronic fatigue (Dabholkar et al., 2014, Goterdelo et al., 2023). Other similar kinds of tasks, such as repetitive cleaning of habitats or feeding of marine animals, further add to the frequency of repetitive strain injuries-especially among more experienced or aging staff.

Apart from physical demands, aquarists work under emotional and psychological stresses that emanate from the responsibilities of continuously caring for aquatic animals (Brando et al., 2023). The pressure to meet these high operation standards is mostly done with a certain number of human resources within short deadlines, which further increases this mental strain. This also increases when there are any absences., This is, the team as the necessary number of aquarists, adapted to their daily tasks. However, this number doesn't cover unexpected absences, such as sick leaves, parent leaves or training absences. Therefore, this will result in an emotional and physical overload since the rest of the employees must cover all the tasks.

Besides, the absence of strategies to cope with physical and mental fatigue, such as rotation of tasks, psychological support, and ergonomic tools, turns aquarists into a long-term hazardous situation. If these issues are not properly addressed, they may lead to increasing absenteeism, reduced productivity, and finally physical and psychological burnout (Ruotsalainen et al., 2014), thus putting in jeopardy the sustainability of the workforce and the overall performance of the Oceanário.

Therefore, comprehensive plans need to be put in place that address the peculiar challenges of aquarists in such a manner as to lessen not just the physical pressures but also the emotional toll. The objective of this work is to propose solutions that would not only cater to the physical and mental well-being of the aquarists but also their ongoing effectiveness, creating a sustainable balance between marine conservation and the management of human resources at Oceanário de Lisboa.

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Definition of the plan

A Strategic Plan will contribute to the development of a set of conclusions aimed at mapping and identifying the current state of physical and psychological support practices within an organization and how these can be improved by a comprehensive model of well-being and ergonomics management. On the definition of the plan will be include action planning and operationalization. The model that will lead the present project to achieve its desired change is as follows:

- *Principles*: The need to restructure working conditions for aquarists in order to focus on ergonomic practices, support physical and mental health to enable sustainable performance.
- *Strategy*: Literature review and qualitative data collection through interviews with aquarists to understand in-depth their daily needs and the problems they face.
- *Product*: Strategic plan to mitigate physical demands among Aquarists.
- *Target*: Aquarists from Oceanário de Lisboa with the potential to impact other aquarists from other Aquariums around the world.
- *Short-term Outputs*: Diagnosis , analysis and formulation of a physical and psychological support plan to provide reliable data, according to the needs of aquarists.
- *Medium/Long-Term Outcomes*: Evaluation reports and goal readjustments from a continuous quality perspective, including improvements in working conditions and preventive measures for injury and burnout.
- *Final Impact:*
    - To improve the labor conditions of the aquarists by enhancing operational efficiency at Oceanário de Lisboa.
    - Improved understanding of the various physical and psychosocial wellbeing strategies, their benefits, and limitations within a context of a demanding work setting.
    - Data storage for ongoing surveillance and also strategic adjustment in the longer term.

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Literature Review

1.1.Animal Care Professionals

This aspiration, for the animal lover, to work and care for domestic, exotic, and marine species is taken to the height of a lifetime dream. Indeed, being an animal carer, especially in zoos and aquariums, has more than a job connotation-it's a vocation – it’s a calling. The sense of calling runs deep with a profound passion and commitment to ensuring animal welfare and contributing to conservation and education efforts. Usually, offer limited financial rewards, few extra perks, and nominal opportunities for career advancement. As can be seen from interviews with zookeepers, for example, whereas the job is considered very significant and central to one's identity, at the same time, this work is also understood as highly dutiful, sacrificial, and requiring a great deal of commitment on the part of the individual involved (Bunderson & Thompson, 2009).

Both, joys and challenges of caring for animals in zoos and aquariums require the establishment of a culture of care at every level of an organization: individual, team, leadership, and organizational (Brando et al., 2023). Many aspects of this role are performed similarly to other roles of animal caregiving, since the well-being conditions of zoo animals and human caretakers are highly interrelated (de Carvalho et al., 2005). Care culture is created by gaining insight into the physical and psychological experiences of professionals that undertake animal care, exploring motivations for entering the profession, and explaining persistence in such arduous conditions of workload, animal welfare concerns, and exposure to harsh weather conditions with most often inadequate financial incentives (Brando et al., 2023).

In fact, it is very important to understand what makes the work meaningful, enjoyable, and engaging for animal care professionals, which may include support systems in place for them and their charges regarding opportunities for professional advancement, appropriate budgets toward the welfare of animals, and even access to healthcare, particularly in diverse parts of the world (Brando et al., 2023). It is equally important to identify these different career stages that individuals go through and their response towards such stages, in order to ascertain their needs and make available appropriate support.

A qualitative study shows that for zookeepers, often the job is a calling; yet this call might also be intertwined with feelings of exploitation or overwork (Bunderson & Thompson, 2009). In the case of having a calling as a motive to work on one hand, work driven by calling could bring an increase in job satisfaction and satisfaction with life in general. On the other

hand, it may also make employees more susceptible to employers in terms of employee exploitation (Duffy & Dik, 2013).

Animal caregiving is both challenging and rewarding, and this dynamic cuts across contexts, disciplines, and facilities (Kogan et al., 2022). Gaining a deeper understanding of the innate stressors associated with animal care professions involves understanding information culled from allied fields such as animal shelters, veterinary professions, and laboratories (Brando et al., 2023). The impact of having a deeper understanding would more significant insight into the well-being and work-life integration of the workers in zoos and aquariums, thus enabling the organizations and people to better serve the animals in their care while contributing with resilience, joy, purpose, and integrity to the broader goals of conservation, education, and research (Brando et al., 2023). This project will try showing some appreciation for their dedication by devising ways to reward the aquarists and support them in finding balance in their work-life and job satisfaction.

Regardless of such a large manpower in animal care professions, it is surprising that little information is available about the impacts of caring for animals in these environments - zoo and aquarium. For that reason, there is an information gap concerning occupational stressors, risks, opportunities presented, and occupation rewards (Carter & White, 2019; Wensley & Slater, 2018).

1.2. Aquarists

An aquarist is a specialized animal care professional responsible for the day-to-day care and management of marine or freshwater species that live in aquariums (Lerer, 2018). Depending upon the type of aquatic facility, aquarists are responsible for animals ranging from fish to penguins to otters to octopuses. Some common responsibilities of aquarists include feeding, observing the health of the animals, cleaning/maintaining exhibits, and sometimes training marine mammals (Crosby, 2001). Aquarists' tasks are also included in the morning, to check water quality, tank conditions, and animal health and to prepare the food, plants, and medicines for the animals. Much of their time is spent cleaning the habitats and tanks, which can be very physically tasking to do (Crosby, 2001).

Most of the intense interactions between humans and animals happen in occupational settings where animal handlers experience common risks of diseases due to zoonotic diseases, allergic reactions, bodily injuries, and psychological stress (Mobo et al., 2010). It has been established that animal trainers, veterinarians, volunteers, researchers, and workers of aquariums are all vulnerable to these risks. As an example, employees who work with marine

mammals have a heightened risk of skin infections like those documented by Flowers (1970), along with other kinds of zoonotic infections described by Hunt and colleagues (2008).

As mentioned throughout this work, these animal care workers are commonly exposed to many occupation health hazards, including biological risks-such things as allergens, zoonotic pathogens, and organic dusts-chemical exposures, including disinfectants and pesticides; physical risks such as bites, musculoskeletal injuries, slips, trips, and falls; and psychosocial stressors, including the fear of attack or disease, compassion fatigue, and burnout (Cohen, 2007; Jeyaretnam & Jones, 2000; Meggs, 1999). A study by Hunt and colleagues (2008) found traumatic injuries to be commonly reported among workers dealing with marine mammals. Many had directly been injured by the animals. Workers who had been in such positions for more than five years constituted a high-risk group, presumably due to their reduced vigilance.

Especially worth noting is that many animal workers are not listed under any formal occupational safety and health programs, which makes them increasingly prone to injury and illness. In order to reduce these risks, full-time workers should be well-trained in the possible dangers and urged to use corresponding safety precautions (Mobo et al., 2010). According to Hunt et al. (2008), occupational health programs need to be designed in such a way that they offer screening for diseases, prevention, and education to employees regarding the different zoonotic risks as an approach to ensuring safety while handling animals. This is not the goal of this project, however there should be more efforts in this sense, adapted for the Portuguese context.

1.3. Physical Health and Well-being in Aquarists or Similar Professions

Aquarists are the ones on whom different responsibilities rest in taking care of the aquarium and aquatic species. Further, they are responsible for the control and maintenance mechanisms which provide a conducive environment for marine life. Hence, these duties often include long hours of standing, much heavy lifting, and wet environments, which may be hazards associated with musculoskeletal disorders (MSDs) among aquarists (Dabholkar et al., 2014; Goterdelo et al., 2023). Health issues among zoo and aquarium employees have been reported and these include back ailments and repetitive strain injuries (RSIs), mainly because of the repetitive aspects of particular tasks, such as cleaning tanks and using equipment. Hunt et al. (2008) shows that RSIs like tendinitis and carpal tunnel syndrome were common amongst aquarium staff. Respiratory complaints are also related to the perpetually moist conditions. Finally, it has also been demonstrated that the wet work environment that characterizes many zoo and aquarium activities further contributes to these conditions.

As mentioned above, respiratory issues are a threat, mainly due to the moist environmental conditions and usually insufficiently ventilated water centers. The constant exposure to water and chemicals adds to the ailments of asthma and chronic bronchitis. Hunt et al. (2008) found a considerable number of employees at the aquarium demonstrating respiratory distress symptoms. These, in turn, were linked to the environmental working conditions of the facility. Slips and falls are common in settings with much water usage around the area, and the floors are relatively slippery. According to Royal Life Saving Society – Australia (2024) slipping and falling is among the leading cases of accidents experienced by working staff in aquariums. This is contributed by the nature of the job, which is physically challenging. Hence, the possibility of experiencing accidents due to fatigue is high. Authors Santos and colleagues (2016) further emphasized that long hours of standing coupled with repeated exertions will ensure that the workers get tired, affecting their performance and increasing the possibility of accidents. The health and safety statistics support this statement when it declared that the major types of injury are related to MSDs and slips trips and falls (Royal Life Saving Society – Australia, 2024). Goterdelo et al. (2023) reported that MSDs made up over 40% of the reported injuries, while slips and falls composed 25%. Besides, the injuries related to aquatic animal handling, such as bites and cuts, though with low frequency, are still significant in nature.

As discussed earlier, the physical demands of jobs such as those of aquarists might give rise to a series of health issues, from musculoskeletal disorders to chronic fatigue. The inclusion of good physical health practices thus becomes crucial in ensuring that careers are sustainable in the long term. One good strategy is through cross-training, where employees are given a chance to learn skills for less demanding roles within the organization. This also enables staff to experience various skills and job roles and provides them with an opportunity to be transferred around tasks that could lower some form of physical activity to avoid overuse injuries (Gignac et al., 2020). For example, an aquarist who is versed in the education outreach or administrative duties can give a rotation among these functions and the other aquarists to result in reduced body load of work.

1.4. Impact of Work Environment Conditions

The European Industrial Relations Dictionary (2011) describes working conditions “as the working environment and aspects of an employee’s terms and conditions of employment. This covers such matters as: the organization of work and work activities; training, skills and employability; health, safety and well-being; and working time and work-life balance”.

It is surrounding conditions that pose specific challenges to workers' safety and wellbeing in aquatic facilities. Further, most of them are characterized by high humidity, wet surface areas, and poor lighting, increasing the risk of slips, trips, and falls-developing into one of the most common types of incidents around those areas (Royal Life Saving Society – Australia, 2024). Wet and slippery floors are exceptionally worse, since it causes serious accidents such as fractures and sprains. The condition is continually aggravated by handling water and any other liquid substances which contribute a great deal to slipping but also affect the workplace in terms of instability.

The continuous contact with water, fluctuating temperatures in aquatic facilities, contribute further to the pulmonary health concerns and skin irritation. High humidity may be a predisposing factor to disease manifestations of chronic bronchitis or even asthma, while constant contact with water and chemicals could cause dermatitis or other skin manifestations (Flowers, 1970; Hunt et al., 2018). This type of health problems urges proactive management of the environment to care for the health of aquarists and other employees.

Modification of working conditions is called for in research findings to reduce or prevent such risks. For example, lighting up the workplace will provide a clearer vision and drastically lower the rate of such incidences. In addition, good lighting will help the worker recognize different types of hazards around and pass on the wet or congested space easily and smoothly (Vahedi & Dianat, 2013). Secondly, establishing a highly efficient ventilation system will regulate and limit humidity levels in the workplace to a bare minimum, thereby reducing respiratory disorders. Proper ventilation maintains a comfortable working environment while at the same time preventing harmful particles from concentrating in the air (Woloszyn et al., 2009).

The nature of the floor material is one of the critical factors that determine slipping and falling. The strategies put in place to deal with these hazards include non-slip mats and proper draining systems. Non-slip mats can help through providing traction on wet floors to prevent slipping, while drainage mechanisms help take water from the floor as soon as possible to minimize pool and slippery nature of the floor (Gimenez-Maranges et al., 2020). Routine maintenance and inspections of these systems will be very important in ensuring that they serve effectively.

Moreover, the quality of the air and keeping the proper level of humidity is important for working conditions. Application of the system for measurement and regulation of the quality of air prevents accumulation of substances which are harmful to health and creates a working environment which can help people maintain good health (Woloszyn et al., 2009). This can

help aquatic facilities improve the conditions that relate to workers' safety and reduce incidents at work and health problems. In this project, the area improvement will be incorporating features that ensure optimization and comfort for the aquarists while working.

1.5.Climate Change and Its Impact on Aquatic Facilities

Climate change brings in new and complicated challenges to the aquatic facilities through environmental conditions in the aquarium and health and safety concerns among employees. With the continuous rise in global temperatures, aquatic facilities are increasingly challenged by maintaining optimal conditions across the varied species found across the facilities. Increased storm intensities, water quality fluctuations, and shifting aquatic species' availability due to habitat alteration are just some of the many ways in which climate change has been updating the operation of these facilities. Each factor adds to increasing frequency and labor-involving maintenance activities that exacerbate physical and psychological pressures on staff members (Donnelly, 2011).

A core concern is how the rise in temperatures will eventually affect aquatic environments. It is suggested that even minor rises in water temperature can lead to severe stress for marine organisms through affecting metabolism, immune function, and behavior (Somero, 2010). For the aquarist, this means an increased demand for constant monitoring and adjusting of water parameters to maintain that delicate balance in which the species can survive. The continuous changes in the water, aquarium cleaning, and mechanisms of filtration and cooling adjustments have, quite a few times, proved physically exhausting. Thereby, increasing these tasks further increases the tendency of staff receiving repetitive strain injuries, musculoskeletal disorders, and generalized body fatigue (Dabholkar et al., 2014, Goterdelo et al., 2023).

In addition, climate change affects an aquatic facility not only regarding a physical environmental impact but also concerns the aquarist in their struggle against the permanent threat of changes that may happen to the environment and disrupt an exiguously developed ecosystem by causing high levels of anxiety, stress, and feelings of helplessness (Dewe et al., 2010). This project has underlined both psychological and physical interventions to enable aquarists to handle such increasing pressures.

1.6. Aquatic Animal Care and Handling Practices

As described, aquarists are involved in occupations which demand hard physical labor, like handling the aquatic animals and their respective environments. Research shows that faulty

handling techniques result in injuries, including cuts, bites, and strains. Hence, proper training and ergonomic tools are crucial to prevent these kind of accidents (Hunt et al., 2008). Good animal handling practices build such skills for maintaining appropriate equipment, such as gloves and nets, for protection of both the handler and the animals, and assume postures that minimize strain on the handler (DeHaven, 2002; Taylor & Buttke, 2020). Further, training in handling techniques and ongoing ergonomics training will reduce the number of injuries and, in general, make the work safer for the aquarist (Borg et al., 2019).

According to Borg et al., 2019, these practices at facilities like the Oceanário de Lisboa can reduce risks by planning species-specific handling and regular training in the use of safe handling techniques. Incorporating advanced tools, such as automated feeders or cleaning devices, can also reduce the need for direct interaction with potentially hazardous aquatic species (Punnett & Wegman, 2004).

1.7. *Ergonomics and Workplace Design for Physically Demanding Jobs*

High physical demands characterize the job of aquarists, and thus strict attention to ergonomic principles is necessary for injury prevention and long-term health. Ergonomics will be treating the science of designing the workplace and job tasks to fit the worker's physical capabilities and maintain minimal risk for musculoskeletal disorders, hence improving productivity (Karwowski, 2018). In settings characterized by manual handling, lifting, and repetition, intervention on an ergonomic basis is required to reduce strain and prevent injury.

These ergonomic modifications include job adjustments in the form of adjustable workstations, the use of assistive devices, and even job rotation. Indeed, studies have shown these to vastly reduce the incidence of MSDs (Punnett et al., 2020). A study conducted by Lee et al. (2021) showed that when workers subjected them to physically demanding jobs, greater reductions were found among those with ergonomic training and workstation adjustments in reported musculoskeletal pain. Furthermore, specific to ergonomic interventions, these have been redesigning the tools or introducing mechanical aids, which studies have demonstrated reduce the physical load to which employees are subjected (Punnett & Wegman, 2004).

Application of these principles to the specific context of aquariums, such as the Oceanário de Lisboa, should therefore consider specific activities performed by aquarists, including continuous bending, lifting, and standing for long periods on wet floors. Thus, creating tailor-made ergonomic solutions for the said aquarists will drastically reduce injury rates and increase job satisfaction. The project proposes assistive devices and ergonomic stations that make the task more comfortable and productive, as suggested in the literature.

1.8. Aging Workforce and Occupational Health

Aging of the workforce presents some unique challenges, especially when one considers the physically demanding jobs of aquarists. Physiological changes may include things like loss of muscle strength, loss of flexibility, and loss of balance that come with advancing age and can change a worker's capacity for heavy work (Kenny et al., 2008). Understanding these changes is essential for developing strategies that allow older workers to remain healthy and productive.

In this regard, recent theories provide enabling frameworks to address the complexities of an aging workforce. The Sustainable Working Life Theory (SWLT) (Nilsson, 2026), part of the SwAge model (Sustainable Working Life for All Ages) emphasizes a multi-faceted approach to work design and organizational practices. This is, incorporates different areas that has an impact on the work sustainability, pointing to a balance of work environments where individual resources, such as health, skills, and motivation, are in balance with demands from the workplace for the sustainability of employment and well-being in the long run. This theory by Nilsson (2016) is appropriate, especially in physically demanding workplaces through the improvement of ergonomic support by adjusting the workloads and allowing the older workers to remain productive. By acknowledging such areas, organizations can establish policies and practices that help their employees manage the physical and psychological burdens of their jobs over time.

Similarity, The Work Ability Model by Ilmarinen (2019) is a conceptual framework evaluates one's "work ability" about the balance between personal resources and work-related factors. It is often depicted as a four-story "house" in which each subsequent floor is built on its predecessor to show a hierarchy of factors affecting work ability of a person. The framework also recognizes external factors such as social, family and community context. The “house” is composed by:

- Health and Functional Capacity: The base level of the model makes up the physical and psychological health necessary to sustain work ability.
- Professional competence: This layer emphasizes continuous learning and development of skills with the ability to adapt to an ever-evolving job demand.
- Values, Attitudes, and Motivation: This floor encompasses the intrinsic and extrinsic motives for working and the importance of personal and organizational value congruence.
- Work, Work Community, and Leadership: The top floor deals with the work environment; that is, leadership, organizational support, and respect in the

workplace. It is these factors that contribute most to a supportive and sustainable work context.

That being said, when developing strategies and procedures, organizations should focus on a first level, on physical and psychological interventions, for instance, through the improvement in ergonomic factors and mindfulness strategies. On other levels, providing trainings to develop professional skills will also have an important impact, according to this model (Ilmarinen, 2019). Therefore, strategies that rely on these components, with a focus on aquarists needs, will maintain a work sustainable work ability.

1.9. *Mental Health and Well-being in Physically Demanding Occupations*

Highly physically demanding jobs, such as being an aquarist, have a high effect on mental health. It was suggested that high physical demands, repetitive tasks, and the emotional workload related to working with living organisms can contribute strongly to stress, anxiety, and burnout (Ruotsalainen et al., 2014). These are further exacerbated by the unpredictability of working with aquatic life, where workers are forced to continuously modulate vigilance and emotional arousal, particularly in situations concerning animal distress or mortalities (Monaghan et al., 2024).

Recent research suggests that it would be expected that the psychological toll in physically demanding jobs depends a great deal on factors such as job strain, low autonomy, and high emotional labor. The Job Demands-Resources (JD-R) Model, suggested by Demeroutu & Bakker (2001) provides a useful framework for understanding these dynamics. Hence, it lays on two primary aspects: demands and resources. Demands, are the aspects of the jobs that require sustained effort, if it exceed, may result in stress. Resources, on the other hand, are any physical, psychological, social, or organizational assets that help employees attain their work goals and reduce the structure of job demands. Therefore, according to this model, whereas job demands are not in shortage-physical exertion, risk of injury, and emotional strain-balance with adequate resources at work, such as social support, autonomy, and positive feedback, is what results in stress at work and burnout (Demerouti & Bakker, 2001). The JD-R model (Demerouti & Bakker, 2001) should be considered when designing interventions. When there is a good balance between job demands and appropriate resources brings benefits from an organizational point of view on productivity and for employee well-being.

In the case of aquarists, the physical demands of the task compounded with the emotional demands of continuously caring and monitoring aquatic species deplete the resources, both emotional and physical (Monaghan et al., 2024). Thus, when designing

strategies, the model should be considerate, taking a deep reflection on the demands which tasks requires and the resources available.

Similarity, the Conservation of Resources (COR) Theory (Hobfoll et al., 2018) postulates that stress occurs when either individuals perceive a threat to their resources, which could be in the form of energy, time, or emotional resilience, or incur losses in one of those resource forms (Hobfoll et al., 2018). Highly demanding occupations involve continuous effort without adequate recovery time to restore resources that are particularly critical, hence, burnout and decreased mental health set in. In the case of the aquarists, this means that due to the efforts workload and demands of the job, they do not get enough rest and, consequently will take to a decrease of the resources.

Complementing these conceptual frameworks, empirical research also underlines the implication of working conditions on mental health. Poor work conditions, including limited rest breaks, inadequate staffing, and a lack of ergonomic support, proved to be substantial predictors of higher rates of psychological distress and burnout among those performing physically demanding work (Demerouti et al., 2001; Edwards, Fortingo & Franklin, 2022). Moreover, animal care work is emotionally burdensome. Research has indicated that this may increase emotional exhaustion arising from the cost of empathy, especially where jobs entail killing or cruelty to animals (Monaghan et al., 2024).

Recent interventions to improve mental health have focused on promoting job resources such as improving social support, increasing job autonomy and access to resources for mental health. Creswell (2017) suggests that implementing mindfulness-based stress reduction programs, along with providing opportunities for peer support and psychological counseling, led to a significant reduction in anxiety and burnout symptoms among workers in physically demanding roles. What all these theoretical insights and empirical findings share is the strong linkage of the mental health and well-being of workers in physically demanding jobs to the emotional and physical challenges of the job.

The aim of this work is to elaborate and implement effective measures that could help improve labor conditions for the aquarists of Oceanário de Lisboa in such a way that will decrease both physical and psychological loads. The main goal of this project is to denote the principal physical and psychological burdens that the aquarist must face every day in performing their tasks and to understand how the current workplace conditions influence their health, motivation, and job satisfaction. Specific interventions, as suggested in the literature, in this regard will be made to advance ergonomic and mental health support with a view to

reducing physical strain and preventing burnout, hence ensuring the sustainability and longevity of the aquarist role in relation to well-being and the quality of care provided to marine habitats.

The present study also looks into how task rotation and flexible job arrangements can contribute to enhancing the sustainability of jobs and their effectiveness and what metrics and feedback mechanisms would lead to the best outcome for determining long-term impact of interventions in well-being and ergonomic strategies on aquarists' performance and job satisfaction. It also tends to develop a replicable wellbeing management model for similar institutions, in contribution to the identification and development of best practices that support wellbeing and productivity for animal care professionals in challenging contexts.

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Methodology

In this chapter, will detail the methodology used, namely, the qualitative method. This methodology was chosen because it carries out the objectives of this project: to develop strategies that would help alleviate and mitigate physical fatigue among Aquarists at Oceanário de Lisboa-strategies conceived to be potentially generalized to any aquarium around the world. Therefore, in order to get a better understanding of this matter, requires delving into the perceptions and experiences of aquarists operating in such a peculiar environment. Hence, considering the methodological approach for the current project, interviews with these committed professionals were the most fitting choice.

This study was, therefore, above all an attempt to inductively explore the everyday life of aquarists, to make visible possibilities for improvement, discovering which physical work demands are most salient, and even uncovering such unknown facets of their work. This approach was found to be the best fit for the research project at hand, as it facilitated not only an intense and complex understanding of the subject matter but also an avenue for exploring new perspectives (Carmo & Ferreira, 2008).

Hence, considering the impossibility to interview all the members of the team, an active decision was made to interview a selection of professionals holding a range of tenures, gender, and areas of responsibility at Oceanário de Lisboa. This strategy was done with the intention of documenting views from the standpoint of a more experience person and an early-career professional.

Therefore, it was adopted the content analysis approach in revealing the treasure of insights hidden within these interviews. This is generally confirmed by Koufogiannakis et al. (2004) and Krippendorff (2004) to adopt a multifaceted view toward examining the research issue at hand, resulting in a detailed and richly nuanced opinions. This will also facilitate organizing a huge amount of information into meaningful categories in order to help us guide our strategies. Any results obtained through this analysis are intangible because they depend on an abstract sphere comprising ideas and opinions expressed by professionals being interviewed. According to Leedy and Ormrod (2019), because such data are intangible, it means that they need to be analyzed with much care to come up with meaningful information. In the light of the considerations above, this research undertakes an in-depth search to try to capture the collective wisdom of aquarists for the holistic strategy while dealing with physical fatigue and enhancing their general well-being from the Oceanário de Lisboa and potentially worldwide.

2.1. Main Objectives

Semi-structured were conducted in order to understand job satisfaction, career progression perception, tools, metrics, variables and strategies these aquarists already have and what other factors should be included when planning their career.

2.2. Sample

Qualitative research is often linked with smaller purposely selected samples (Carmo & Ferreira 2008). In this research, the qualitative study was guided by a non-probability sample, using the purposive (judgmental) method of sampling. The selection itself is a deliberate sampling choice, wherein the participants are designed to meet the predefined research objectives and expected results. The careful identification of participants was, therefore, significant in setting the research methods to the unique features and aims of the study for which the findings had to be specific and relevant. It also laid a very strong foundation for subtle standpoints and further understanding of the subject matter.

In this context, Oceanário de Lisboa has a team of 25 aquarists and our selection process relied on the work experience of each participant. This was done on the premise that this subset is a representative cross-section of a bigger population of aquarists. Hence, a sample size of 8 was chosen to balance the insights we got with regard to depth and variation. We regard the sample size as substantial and at the same time varied enough to encompass the experiences and views of aquarists in general. This approach secures the authenticity of the findings and enhances the overall quality and comprehensiveness of the study. The selection of these 8 individuals was agreed with the Head of Biology and Conservation in order to avoid interfering with work routines.

To maintain privacy and confidentiality regarding what the participants shared, they will be named Participant 1 (P1), Participant 2 (P2), Participant 3 (P3), Participant 4 (P4), Participant 5 (P5), Participant 6 (P6), Participant 7 (P7), Participant 8 (P8), according to the chronological order in which the interviews took place. All interview transcriptions can be consulted in Appendix B – Interviews' Transcription.

Participants	Interview date	Age	Tenure	Gender	Sector
P1	12/07/2023	32	5	M	Underwater Forests
P2	12/07/2023	47	23	F	Kitchen
P3	13/07/2023	45	16	M	Cover
P4	13/07/2023	46	18	F	Atlantic Habitat
P5	27/07/2023	31	7	M	Central Aquarium
P6	28/07/2023	42	16	M	Galleries

P7	28/07/2023	26	5	F	Galleries
P8	31/07/2023	29	1.5	F	Galleries

Table 1- Interviewees data (M-Male; F-Frmale)

2.3. Procedure

The qualitative study is developed in a sequence, properly structured in phases. First, in one of the monthly Biology classes, this project was presented to the team, explaining the core of the goals and describing the course of the action. Then, identification, in the second phase, focused on determining aquarists who could form a representative sample of the population. Once this group was determined, individual participants were approached to determine their interest and availability to collaborate. The next step, therefore, with the support of the Administrative Assistant, was to make detailed preparations toward holding meetings with each participant. This process was underlined at every moment with careful considerations toward their availability to ensure that the disruption to their routines and work commitments would be minimal. In addition, Oceanário de Lisboa's responsible, signed a document authorizing the project.

The phase of interviews followed. Based on a script, which it was designed with the valuable support of my project's supervisor, my manager, and a member of the Biology and Conservation department, the meetings were conducted using this semi-structured script. The script was composed of 10 open-answer questions, created from some informal research, collective knowledge, and expertise in the field by the participants. This script can be found in Appendix A - Interview's Script.

The main objective of using open-ended questions was to transform the interview process into informal and interactive discussions. This manner of approach provides candidates with an opportunity to express their opinions and ideas regarding different aspects, which include their functions and roles, with much ease. It has also provided a platform for an in-depth understanding of how the existing tools and strategies are perceived by the employees and their possible effects on the day-to-day experience of the aquarists, with the focus being specifically on physical aspects of their work. These interviews took place in Oceanário de Lisboa facilities during July and they had an average duration of 45 minutes each and were conducted in Portuguese.

Each interview was preceded by the presentation of the project and its fundamental aims. Subsequently, each participant was requested to sign an informed consent form in which the voluntary and confidential nature of their participation was explained. The participants were

reminded that they were at no obligation whatsoever to answer any question if they did not feel so inclined. Furthermore, in this consent, it was stated that participants gave permission for a voice record. The interviews were recorded to aid in conducting a more detailed and accurate content analysis to avoid losing data. The structure of the meeting was then explained, and the opening question was "How old are you, and how long have you been in this organization?" Each of the conversations was then transcribed and analyzed in depth.

2.4. Variable measures

The nature of measurement for the information gathered through the interview will be intangible in nature, as only concepts, ideas, and opinions are measured (Leedy & Ormrod, 2019). It will be very important to understand what was done up until now regarding strategies by starting the project with this qualitative study-on one hand-and, on the other hand, to identify what these professionals would like to see changed, suggesting other practices that will have a positive impact on the position. This will be relevant to point out which will be the most suitable strategies to implement in the future.

Findings and Results

In this chapter the qualitative results from the interviews are presented. Considering the questions and their answers, it was possible to aggregate them in three main areas: the motivation to work at the aquarium, physical and mental challenges, and strategies.

3.1.Motivation to work at the aquarium

Since I started working at Oceanário de Lisboa, I've noticed something: everyone has deep connection with the sea and precepts the organization as the dream-job. Thus, the first question of the interview confirmed this.

During the interviews, all the participants mentioned their admiration, passion, and connection to the ocean, and most of them connect it to a related or even a teacher. For instance, a participant shared that their love for the sea and aquariums was nurtured through their relative. They remarked:

> " I've always loved aquariums, I've always had aquariums ever since I was a little girl. Then, also under the influence of my brother, I chose the field of marine biology, because he's also a marine biologist " (P8).

In a similar vein, a participant noted the influence of his mother, since she was a science teacher, stating.

> " Ever since I was a kid, my mum was my science teacher and I thought I'd definitely go into science from an early age, from the seventh grade onwards " (P1).

In addition to personal passion, the Oceanário's reputation also played a crucial role. P1 expressed admiration for the institution, emphasizing its leadership in marine conservation:

> " I was very interested because it's a renowned company and I'd say it's a pioneer in conservation " (P1).

3.2.Physical and Mental challenges

As previously mentioned, aquarists face several physical and mental challenges in their roles. Participant 3 highlighted the demanding nature of the job, providing some examples, from diving to the fish preparation,

"‘it's all heavy and all physical. if you don't go diving, you go to the kitchen and stand for two hours, walking from one side of the kitchen to the other, cutting up fish, sometimes palettes of fish come in and it's 750kg of fish" (P3).

This sentiment was echoed by P5, who mentioned that all his job is made in a high volume and dimension:

" It's big and heavy. I mostly have full days, with lots of things, lots of dives, always lots of activity, lots of effort" (P5).

In this questions all the participants highlighted the weight and the diving as their biggest physical challenge.

On the mental challenges, the responsibility for animal welfare is mentioned as being overwhelming. P5 expressed concerns about the stress associated with ensuring the health of the animals:

" I have a sick animal and the vet is going to look at it. That's the most routine thing in the world for me, but my anxiety only goes away once it's finished, until I'm sure everything went well" (P5).

Another mental challenge, mentioned several times, was the time management, namely, making sure everything is ready before the aquarium open to the public.

“Sometimes there's too much work for too few people. I think the big challenge is managing your time and doing things well. Then there's the pressure. You have to pay a lot of attention to your tanks; everything has to be just right” (P8).

Very related to mental challenges, anxiety and stress are present in the daily basis of the aquarists. Anxiety in this profession often relates to time management and animal welfare. P6 expressed the pressure for meeting the deadlines and having the ability to handle everything.

" (…) to respond to a series of situations that sometimes arise at the same time, and to do one thing and think about what you have to do next and have the mental gymnastics to be able to string tasks together, to be able to do everything you have to do throughout the day within the useful time" (P6).

There was also the issue of lack of recognition and the feeling of undervaluation:

" This lack of recognition makes me uncomfortable " (P4).

Even with these stressors, many were motivated by their jobs and especially with the importance in marine conservation.

Regarding the physical conditions, some of the tasks carried out by aquarists are physically demanding and, usually, daily. In the case of P1, diving and cleaning at the bottom were some of the most relevant tasks:

" Diving, whether it's cleaning the acrylic or the glass, the diving part is really where we need to make the most physical effort. " (P1).

In this regard, P3 has concurred because diving, among other activities, is undertaken in a very intense manner:

"At the end of the dive, they arrive at the pier and everything is rotten, they're ready for bed. We do that and then we have four hours of work. Why is that? Because when you're diving and there's water in contact with your body, it causes stress and physical wear and tear " (P3).

P4 pointed out the difficulty with heavy material handling, which was done daily:

" In my area the machine isn't that heavy but it's still hard, it's very physical. Working in the kitchen, lifting boxes, large volumes, heavy weights is very tedious " (P4).

This frequency underlined how aquarists were in a physically demanding job each week.

Some seasons of the year are more demanding than others, however, doesn’t have a huge impact, according to the interviewees. Transversally, all the participants reported nearly the same periods with higher volume of work. P5 resumed them:

“(…) the summer periods when new animals come in. In summer, when there are more holidays, it's still the same job but with fewer people, there's more light, the tanks get dirty faster. There are more people at the exhibition, things fall into the water and that also has an impact." (P5).

Despite these challenges, interviewees also highlighted the rewards of the job. P1 and P4 described the joy of working closely with animals, stating:

“Really, the greatest reward is working with animals” (P1).

“(…) when you have you and an animal in a completely, how shall I put it, personal relationship that nobody can see, something that's underwater” (P4).

3.3.Strategies

Physical demanding tasks are very present in the daily basis of the team and, inevitably, the tiredness too. Some strategies mentioned for minimizing physical fatigue included work rotation and task sharing. P6 said that staff rotation in different habitats should be higher to avoid fatigue.

"We know that there are areas that are more demanding than others, so promoting the rotation of people, I think, would help to mitigate this fatigue. I think promoting a certain rotation in the areas could help" (P6).

P4 also shared the opinion that work needs to be shared among more workers.

" More rotation in diving. In the case of the pressure machine, having more people doing it (...). There's no other way to do it, the only way is to rotate everyone’ (P4).

Apart from rotation, rest and recovery time is also an important factor, namely for the one who dived in the morning shift. Participant 8 suggested increasing the time for breaks and even reduced schedules:

"(…) those who dive could have more hours of rest or shorter hours. For example, on the day you dive, you can leave 30 minutes earlier, that makes a huge difference” (P8).

To also support these operational strategies, interviewees suggested some tools and technologies helping to overcome physical effort. P1 and P7 indicated automated solutions, like an automatic glass cleaner:

“(…) an automatic machine that could clean the glass by itself” (P1),

“(…) an electric brush” (P7).

Furthermore, P3 noted a cart to transport the food, that was used in the past, and it was very useful in a lot of ways.

"And we have a trolley, we put the things on the trolley and, even to speed things up in terms of work, one person would get there to collect all the things, distribute them to everyone and we'd be able to do more things " (P3).

Additional supportive gear mentioned included was a posture support vests to maintain posture straight at work.

"They have a waistcoat that looks like a belt. In other words, what happens when they pick up a weight automatically (...) I saw you make that movement, which is that he's wearing it and it's like a waistcoat with a belt. In other words, it protects the back" (P2).

It was also suggested to invest in better footwear and ergonomic tools for enhancing comfort in general. Aquarists need appropriate management of physical fatigue to maintain their own well-being. P8 emphasized that sleep and rest are the basics:

" If I have a week with more dives, I go straight home, eat and sleep," (P8).

Rest during weekends was also mentioned as an opportunity used for recovery.

P7 suggested that exercising in the gym helps in recovery, however, emphasizes the importance of being in good physical conditions:

"I've recently started going to the gym, because I see a lot of my older colleagues who already have a lot of ailments associated with work, tendonitis, knees, joints, back pain... I know that the work is heavy, and I feel that we really need to strengthen our bodies, because in a few years' time with this workload, if we don't look after our bodies, we're all going to be very unwell, and so I think that's really important" (P7).

Besides that, P2 contributed with the regular practice of yoga, aiming for flexibility, core strength and posture:

"(…) nowadays, yogas and things like that also help us a lot to get a sense of what it's like, forcing us to posture ourselves because I think posture is fundamental " (P2).

The psychological approaches were referred as also making many contributions to dealing with fatigue. P8 mentioned socializing and entertainment as a form of psychological disconnection from work:

"Usually what I do is get out of here and go and be with my friends. Even if it's just for a little while, it makes me feel much better straight away " (P8).

In addition, and aligned with the requirement of meeting psychological needs, it is also important to provide psychological training. For example, P1 recommended classes in mindfulness which would lower the level of stress:

"(…) mindfulness has already been done, I've never been but there should be again because I wanted to try it (...) I think it helps " (P1).

The last question referred to possible changes and suggestions that could be made in order to enhance the well-being of the interviewed aquarists. There was mentioned by the interviewees of better remuneration and professional development. P3 pointed out:

'In terms of careers and pay, because we're all earning the same and that's affecting us sooner and sooner (…). " (P3).

P8 further suggested that easy access to physiotherapist services on a regular basis should be provided to counteract physical strain:

"It might be a good idea to have a counsellor or help in that sense. Someone you could talk to about work and who knows your world, the conditions of your work, and your work, and being able to talk to someone about it, a lot of the physical part would calm down a bit, since I associate physical tiredness with the psychological part a lot" (P8).

Another important area was work-life balance. P5 suggested flexible work options for administrative tasks, would be interesting:

"Couldn't there be a rotation, a sort of hybrid job, and in the afternoon if you're only going to be on the computer you can stay at home?? " (P5).

Intervention Strategic Plan

Working in a place as demanding as Oceanário de Lisboa, where the work of an aquarist is very physical and exposes itself to the emotional that arises from time to time, checking how they are is perhaps our biggest challenge. Aquarist routine activities may include heavy lifting, diving, and maintaining the standards of marine life at the highest level; it has every potential to lead to physical strain and mental fatigue. According to Badarin et al. (2021) and Kovacs (2023), all the above challenges do require effective addressing with the help of a multi-dimensional approach which includes physical conditioning, ergonomic support, work design, mental health, and education.

The main activities outlined in the following strategy are aimed at fostering aquarist well-being and sustainability. It was designed evidence-based programs and interventions that aim at reducing the physical and psychological demands of the job and improving the workforce to be healthier and more resilient. These strategies will be provided in order to meet their short- and long-term needs, ensuring that aquarists do their work to perfection while maintaining their health. Such a facility will, therefore, be organized on the following levels:

1. *Improve Physical Conditioning and Support*: On-site gym facilities with specifically designed exercise programs based on aquarist needs; physiotherapy treatment in order to alleviate and prevent physical problems - one of the most common occupational hazards - or work-related musculoskeletal disorders (Mänttäri et al., 2021; Vingård et al., 2009).
2. *Ergonomic Work Design and Equipment Upgrades*: To minimize repetitive strain among employees, is suggested an investment in an ergonomic set of tools and equipment at work and, additionally, supports the introduction of task rotation (Heidarimoghadam et al., 2022; Punnett & Wegman, 2004; Van der Molen et al., 2017).
3. *Adapt Working Hours and Recovery Time***:** Discussion below elaborates on how adaptation of the work schedule and enhancement in recovery support so that it may prevent fatigue and preserve general health (Ferguson et al., 2019; Sadeghniiat-Haghighi & Yazdi, 2015; Virtanen & Kivimäki, 2018).
4. *Training and Education on Physical Health***:** Training on posture and lifting is necessary while workshops and training on nutrition and hydration will help in the optimization of physical health and performance of individuals (Dutta et al., 2016; Robertson & Hupert, 2016).

5. *Mental Health and Burnout Prevention***:** The last layer of the plan is to have programs on psychological support and mindfulness training in handling stress and preventing burnout. (Creswell, 2017; Demerouti et al., 2001; Tetrick & Winslow, 2015).

These will deliver a more supportive workplace environment at Oceanário de Lisboa that will address urgent physical and mental demands and provide for long-term health and career sustainability for aquarists in service.

4.1. Improve Physical Conditioning and Support:

On this part of the program, which the focus will be the improvement of physical conditions, it is recommended to create an on-site gym and a fitness program including strength, cardiovascular, flexibility and mobility trainings along with team-buildings. In addition, a physiotherapy service with diverse dimensions it is also suggested, to further support of the physical well-being of the aquarists. Thus:

4.1.1. On-Site Gym and Fitness Programs:

It will be very important to establish a gym on the site, specific to the particular physical demands put on aquarists for health maintenance and injury prevention. The typical daily actions of an aquarist include many physically demanding activities, including but not limited to lifting, diving, and repetitive movements that stress a particular muscle group such as the shoulders, back, and knees. A developed exercise program will focus on strength, flexibility, and cardiovascular health, with stress-reducing activities such as yoga and pilates. Proof that strength training in combination with flexibility exercises reduces injury risks, improves posture, and improves the long-term physical health of the workers, especially in physically demanding jobs (Mänttäri et al., 2021; Prieske et al., 2019).

Program Components:

1. Strength Training: The program should focus on the core, shoulders, back, and legs- those are muscle groups that aquarists use quite heavily. This strengthening of the mentioned areas through resistance training, including weightlifting and resistance bands, along with bodyweight exercises, will improve muscle resilience and thus prevent overuse injuries. Strength training has been evidenced to enhance physical resilience and reduce musculoskeletal injuries among persons in the physically demanding jobs and this also improves job performance (Mänttäri et al., 2021).

2. Cardiovascular Training**:** Aquarists, especially divers whose performances are very reliant on how much air their lungs can hold and sustain them, there is a need to have a fit cardiovascular system. Other out-of-water aerobic training exercise such as cycling, swimming, and rowing will also increase their endurance levels and enable them to make long dives without the feeling of fatigue setting in. It is suggested in the literature that aerobic exercise strengthens the heart, perittoneum and lungs to reduce fatigability and increase physical tolerance to hard work (Dutta et al., 2016).
3. Flexibility and Mobility Training**:** The program will also incorporate yoga, pilates, and dynamic stretching exercises are included in the program to boost mobility and reduce stiffness, which prevents repetitive strain injuries. Aquarists need this aspect of exercises especially because many of the duties they engage in while at work are repetitive in nature and are done with confinement, such as cleaning tanks or processing aquatics. Yoga and pilates flexibility exercises enhance balance and posture, increasing muscle coordination hence decreasing workplace injury risks (Mänttäri et al., 2021).
4. Team-Building Fitness Activities**:** Group yoga and pilates sessions will be conducted weekly that are very essential in building team morale and reducing stress. Such activities ensure better physical flexibility, help to become more mentally fit and resilient, relaxed. Group fitness activities reduce stress, build team spirit, and have a positive effect on both physical and mental health (Creswell, 2017; Dutta et al., 2016).

4.1.2. Physiotherapy Services:

The goal of having regular physiotherapy services is to support aquarists with regarding chronic muscular problems, injury prevention, and long-term physical health. Workers are highly at risk of developing musculoskeletal disorders due to their repetitive tasks and heavy lifting; thus, one of the main fields of concerns in these physically demanding jobs is physiotherapy. It was considered among the best preventive and interventional techniques. (Khalid et al., 2015;Vingård et al., 2009; Vitoulas, 2022).

Program components:

1. Regular Physiotherapy Sessions: Physiotherapists will visit the center twice a week to participate in the assessment and delivery of therapeutic exercises to the aquarists. These consultations shall focus on treating and preventing the three most frequent injuries: shoulder, back, and knee strain. Routine physiotherapy services lower the incidence of musculoskeletal disorders and enhance recovery from work-related injuries (Vingård et al., 2009).

2. Individualized Physiotherapy Plans: Each aquarist will be given an individual plan that considers a person's particular physical limitation and demand at work. This type of plan will contain stretching, strengthening, and recovery exercises that target the specific weak points or repetitive strain. Therefore, injury prevention by a more personalized physiotherapy plan is more effective than generalized programs, especially in those professions entailing a lot of physical stress on the body (Khalid et al., 2015).
3. Ongoing Monitoring: Physiotherapists shall provide long-term monitoring of physical health status in aquarists. Progress shall be followed, and further treatment plans modified in relation to individual needs. The support will play a great role in ensuring that minor physical injuries are taken care of and do not become chronic. Long-term injury prevention and management in physically demanding occupations need continuous monitoring and adjustment of therapy programs accordingly (Khalid et al., 2015).

4.2. Ergonomic Work Design and Equipment Upgrades:

In this component of the program the focus will stand on improving the equipment on an ergonomic perspective and, aligned with it, it’s recommend implementing a task rotation schedule.

4.2.1. Ergonomic Equipment:

It is, therefore, essential to invest in the use of ergonomic equipment and tools to reduce the physical stress an aquarist goes through while performing his everyday duties. The proper optimization of the workplace design with the appropriate use of ergonomics will lead to a great reduction of musculoskeletal injuries. In this respect, here's an elaborated approach:

Equipment and Upgrades:

1. Electric Brushes: An electric brush shall replace manual scrubbing tools to perform cleaning tasks of the tanks. This reduces the usage of repetitive arm movements and reduces strain on shoulders and wrists. Therefore, the substitution of electric tools for manual ones reduces musculoskeletal fatigue and increases the output as the repetitiveness of a task is also reduced (Punnett & Wegman, 2004).
2. Compressed Air Lines: The installation of compressed air lines in all aquarium eliminates the need for moving heavy gas tanks to maneuver them. The substitution reduces the physical stress on the aquarist and minimizes risk to back and shoulder muscles. Hence, the ergonomic solutions, such as the use of compressed air systems,

avoid work injuries from heavy lifting and awkward postures (Van der Molen et al., 2017).

3. Improved Transportation Carts: The investment in transportation carts to transport food and equipment that shall be ergonomic, adjustable, and easy to maneuver shall reduce the physical strain and hence prevent injuries that result from the handling and transportation of heavy loads. Such ergonomic carts that have features like adjustable height and, therefore, are better maneuverable will reduce the probability of musculoskeletal disorders (Borg et al., 2019).
4. Posture-Support Vests: Introduce the use of wearables in posture-support vests to aquarists in their performances during tasks with high physical exertion to reduce long-term strain on back and shoulders. These supports or posture-supporting gadgets can radically reduce the incidence of back pain and improve comfort during repetitive tasks (Vingård et al., 2009).

4.2.2. Task Rotation:

Third-party task rotation will minimize the repetition associated with higher and lower-level tasks by rotating aquarists through each of these tasks. Task rotation is an effective strategy to reduce musculoskeletal disorders and generally enhance job satisfaction.

Implementation Plan:

1. Designing the Rotation Schedule: Design a rotation schedule that intersperses the heavy lifting with other tasks such as diving and light duties, including administration and the maintenance of equipment. This will prevent any one task from being too repetitive and, therefore, minimize the possibility of strain. Indeed, it has been proved that task rotation has positive effects on musculoskeletal health owing to the variation in physiological demands imposed on workers, hence preventing repetitive strain injuries in the process (Borg et al., 2019).
2. Regular Review and Adjustment: This needs to be periodically reviewed and modified based on the feedback coming back from the aquarists and observed results in relation to tuning the rotation for optimal benefit to the team and in response to any emerging issues that have arisen. Thus, continuous adjustment and review of task rotation schedules enhance their effectiveness in reducing fatigue and improving job satisfaction (Borg et al., 2019).
3. Training on Task Rotation Benefits: Provide training sessions that educate the aquarists on the benefits of task rotation and proper techniques for each task. The idea is that

training in this regard would make them understand the principle of varying the tasks to prevent injury and improve the general performance of the job. Training on benefits of task rotation results in higher employee engagement with better understanding of how to manage physical strain (Borg et al., 2019).

4.3. Adapt Working Hours and Recovery Time:

This component of the program centers on strategies to reduce working works which involves shorter shift for divers, regular rest breaks and flexible scheduling. The second part of this division relies on providing comprehensive recovery support.

4.3.1. Reduced Work Hours for Divers:

The working hours for the divers should be adjusted, along with much more rest breaks to avoid letting the workers work to a point of fatigue and fall. Since the nature of diving is very physically exhausting work, shortened work hours and rest will keep them both physically and mentally fit.

Strategies for Reduced Work Hours:

1. Implement Reduced Shifts for Divers: Decrease the working hours per shift for those aquarists diving more often. For instance, no diving shifts should exceed 4-6 hours, by which time divers are not overtly exhausted, leaving appropriate recovery time. These studies prove that reducing work hours for a stressful job decreases fatigue, whereby improving performance at work and overall health (Ferguson et al., 2019; Sadeghniiat-Haghighi & Yazdi, 2015; Virtanen & Kivimäki, 2018).
2. Introduce Regular Rest Breaks: Schedule regular breaks throughout the day so that divers can rest and recover. This should be strategically done to prevent the onset of fatigue and allow for continued high levels of performance. It was showed that regular rest breaks are effective in the reduction of both physical and mental fatigue, improve recovery, and enhance job satisfaction (Sadeghniiat-Haghighi & Yazdi, 2015).
3. Explore Flexible Scheduling: It has also been observed that providing flexible work hours or a compressed workweek to senior divers helps in maintaining the workload in a more responsible manner and provides extra time for recovery. Flexible work arrangements reduce the level of stress and prevent burnout in physically demanding jobs (Ferguson et al., 2019).

4.3.2. Increased Rest and Recovery Support:

Rest areas development and restorative practices will become vital in helping these workers recover physically and mentally in this highly stressful environment. These kinds of support help aquarists not only avoid burning out but also help them better enjoy their work.

Strategies for Increased Rest and Recovery:

1. Establish Designated Rest Areas: Design quiet, comfortable rest areas where aquarists can take brief breaks throughout their shifts. Rest areas should have seating, features to aid relaxation, and few distractions. Therefore, providing specific rest areas contributes to reduced burnout and better restoration, especially for very demanding jobs (Robertson & Hupert, 2016; Stutting, 2023).
2. Encourage Restorative Practices: Encourage habits of mindfulness and power naps. Training regarding mindfulness techniques and providing them with scheduled time to take a brief nap will help in general well-being and potentially reduce the level of stress. It has been scientifically proven that through mindfulness techniques and power naps, level of stress can be reduced along with improvements in cognitive functioning hence this practice promote recovery for physically heavy work (Creswell, 2017).
3. Implement Recovery Workshops: Conduct workshops on effective recovery strategies, such as the benefits of rest, techniques for managing relaxation, and proper sleep hygiene. The workshops will make aquarists more aware of how to handle their personal time more effectively. Workshops in education about recovery and stress management lead to improved job satisfaction and a lower risk of burnout (Tetrick & Winslow, 2015).

4.4. Provide Training and Education on Physical and Mental Health:

The following module recommends raising awareness and providing resources to the aquarists, on one hand, regarding posture and lifting techniques and, on the other hand, on nutrition and hydration. There is:

4.4.1. Posture and Lifting Techniques:

Training in the proper methods of ergonomic practices, including proper lifting and posture is considered the number one preventive measure against musculoskeletal injury among

aquarists. Proper training can enable employees to practice techniques correctly to avoid injury, which would raise their over-all job performance.

Training Program for Posture and Lifting Techniques:

1. Ergonomic Practices Training: Provide comprehensive training on ergonomics, including correct lifting, posture maintenance and safety usage of equipment. The lifting biomechanics training, the importance of keeping the spine in a neutral position, and how to minimize strain. Accordingly, correct ergonomic training will prevent injury and improve performance as it will demonstrate how employees will keep themselves from strain and maintain good posture (Robertson & Hupert, 2016).
2. Hands-On Workshops: Hands-on workshops are done to make the aquarists practice the lifting techniques and ergonomics. These workshops should be demonstration-based activities, including hands-on practices for the workers, where ample opportunity to provide feedback will be given, since hands-on practice solidifies learning as employees apply ergonomic principles in everyday tasks more successfully (Robertson & Hupert, 2016).
3. Ongoing Refresher Courses: Regular refresher courses should also be provided to help aquarists remember and apply the ergonomic principles. The refresher course may be incorporated into regular training cycles or within health and safety briefings. It was showed that, regular refresher training maintains awareness and compliance with Ergonomic practices contributs to long-term prevention of injuries (Robertson & Hupert, 2016).

4.4.2. Workshops on Nutrition and Hydration:

Offering nutrition and fluid workshops to aquarists will help them understand the balance of nutrition and fluid intake that would improve the energy levels, making their bodies resilient. Proper nutrition and hydration are very important in managing fatigue and supporting peak performance.

Workshop Program for Nutrition and Hydration:

1. Nutritional Education Workshops: Provide workshops on basic topics of nutrition balance, critical needs for macro and micronutrient, and meal planning for energy and recovery. Such workshops can be interactive to know how to eat healthily with tips that aquarists relate to in the demands associated with their work. It is evident that nutrition education has the effect of boosting physical resilience and managing energy levels, which employees engage in hard physical tasks need (Dutta et al., 2016).

2. Hydration Management: It's important to include topics on hydration, how to control fluid intake, and the effects of dehydration on work performance and health. Explain and provide practical advice on how maintain proper hydration throughout a workday. Thus, proper hydration is fundamental for keeping energy and preventing fatigue, particularly during long or very demanding shifts (Dutta et al., 2016).
3. Interactive Sessions and Meal Planning: Engage in participatory activities where meal planning, dietary strategies, and personalized advice by nutrition experts are debated. This kind of hands-on activity will help aquarists put the nutritional principles into their daily practices and more interactive and personalized nutrition education results in increased learning and healthy eating. (Dutta et al., 2016).

4. 5. Mental Health and Burnout Prevention:

Finally, this section focuses on providing psychological support programs, including access to psychologists, mindfulness training and stress management techniques, to support the employees.

4.5.1. Psychological Support Programs:

Following the need of supporting employees, on a psychological level, it would be interesting to offer a mental health program in that could provide access to psychologists, helping aquarists coping with their workplace stressors and build resilience. This professional psychological support will help to reduce stress, prevent burnout, and provide overall well-being.

Program for Psychological Support:

1. Access to Psychologists: Create a program whereby aquarists have access to a psychologist on a regular need. This may be through direct on-site counseling or through arrangements with local psychologists. Ensure all aquarists know how to access them and encourage them to make use of these services. Hence, resilience is raised, and absenteeism reduced when mental health programs guarantee access to psychological support, thus enabling employees to cope with stress (Demerouti et al., 2001; Tetrick & Winslow, 2015).
2. Regular Mental Health Assessments: Offer periodic mental health assessments enable the detection of early signs of stress or burnout and the use of prompt measures. This should be handled professionally with discretion in issues pertaining to mental health.

It was suggested that regular mental health assessments can offer opportunities for the identification of early signs of stress. Early identification of stress can prevent other serious conditions from setting in (Demerouti et al., 2001).

3. Confidential Support and Counseling Sessions: Counseling sessions should be provided individually and for groups when the need arises to cope with both personal and work-related stress. Confidentiality in counseling services encourages use and hence is helpful in effective treatment of cases related to mental health (Tetrick & Winslow, 2015).

4.5.2. Mindfulness and Stress Reduction Workshops:

Provide training in mindfulness and stress reduction workshops that enable aquarists with the skills to handle stress during troubled times, such as peak seasons or moments of crisis. This will help build their mental resilience and further enhance their capacity to do their jobs better.

Workshop Program for Mindfulness and Stress Reduction:

1. Mindfulness Training Sessions: Provide mindfulness workshops focusing on meditation, breathing exercises, and simple ways of relaxation. These sessions shall help aquarists to deal with stress better, providing them strategies. Literature shows that proving that mindfulness-based interventions reduce stress and burnout while improving job performance (Creswell, 2017).
2. Stress Management Techniques: Provide training on coping skills, such as cognitive-behavior techniques and time management., including xercises and tools that can be applied to daily work. Teaching employees stress management techniques helps them respond to job demands more constructively and lessens feelings of overall stress (Creswell, 2017).
3. Regular Mindfulness Practice Integration: Encourage the inclusion of mindfulness practices into daily routines. Offer follow-up sessions or support groups to help aquarists maintain their mindfulness practices and address any challenges they have been facing. Such practice and continuous support are main factors that enable maintenance of the benefits resulting from mindfulness training and a proper decline in the level of stress (Creswell, 2017).

Evaluation and quality control of the intervention plan

To measure the efficiency of the above plan, it is recommended to utilize different methods, such as the combination of subjective self-reports, observational tools, and objective physiological assessments that can be found in already existing literature. All of these key areas will be measured by using previously validated scales and methodologies, described below:

5.1. Improve Physical Conditioning and Support

The effectiveness of any interventions to improve physical conditioning should also be determined using a variety of fitness tests and self-reported measures of discomfort. As stated by Mänttäri et al. (2021), physical fitness tests would consist of such things as cardiovascular endurance-VO2 max-and muscular strength-grip strength and squat endurance-to determine the physical conditioning improvement. This is further confirmed by Vingård et al. (2009), who wrote that self-report pain scales-like NRS (0 to 10) and VAS-are valuable for the determination of pain and discomfort. These questionnaires can be asked again and again so that changes to pain, especially of musculoskeletal nature, can be accurately ascertained. There is a need to identify physiotherapy service utilization through monitoring consultations and patient outcomes post-intervention.

5.2. Ergonomic Work Design and Equipment Upgrades

Designing the job to be more ergonomic and upgrading equipment. Injury reports along with observational tools and employee feedback should be taken into consideration when evaluating ergonomic interventions. Punnett and Wegman (2004) recommended analyzing data from epidemiology as a method of monitoring the incidence of MSD change due to the improvements of the ergonomic intervention. Self-reported questionnaires, such as the Nordic Musculoskeletal Questionnaire (NMQ), can be applied for assessments of discomfort perceived in individual body areas. Heidarimoghadam et al. (2022) determined that an assessment of physical strain and risks of potential injury related to specific work activities must involve the use of ergonomic risk assessment tools such as the Rapid Upper Limb Assessment (RULA) or the NIOSH Lifting Equation. Employee satisfaction in terms of ergonomic upgrades will be measured using Likert-scale surveys that gain perceived comfort and health improvements.

5.3. Adapt Working Hours and Recovery Time

During the implementation of working hour adaptation and recovery support, monitoring of fatigue and effectiveness of recovery necessarily should come first. According to Virtanen and Kivimäki (2018), self-reported fatigue scales, such as Fatigue Severity Scale

(FSS), should be adopted for tracking purposes regarding worker fatigue over time. Moreover, the Pittsburgh Sleep Quality Index (PSQI), which was used in the study by Ferguson et al. (2019), captures the general quality of a person's sleep and recovery resulting from work schedules. In relation to the measurement of recovery, Sadeghniiat-Haghighi and Yazdi (2015) recommend supplementation by quantifying levels of sleepiness or fatigue as consequences of work shifts using the Karolinska Sleepiness Scale and Epworth Sleepiness Scale. These self-reports will provide a basis on which more objective measures, such as recorded hours of work and absenteeism, can be cross-referenced to demonstrate a thorough understanding of worker recovery and well-being

5.4. Provide Training and Education on Physical Health

Results from these trainings and educations on physical health should be measured through knowledge retention tests, along with observational assessments for success. Robertson and Hupert (2016) recommend pre-and post-training measures through the use of multiple-choice tests to measure knowledge retention concerning proper lifting techniques and posture. According to Dutta et al. (2016), one should conduct observational measures that include the video analysis of posture and manual handling techniques before and after the training interventions. The rapid entire body assessment (REBA) is a widely used tool for assessing posture and strain, which also needs to be employed to monitor any changes in physical behavior and the effectiveness of training programs.

5.5 Mental Health and Burnout Prevention

Validated psychological scales should be employed to assess mental health and the prevention of burnout strategies. According to Creswell (2017), Mindfulness Attention Awareness Scale (MAAS) should be adopted in the measurement of the psychological consequences of mindfulness-based interventions. Cortisol levels are a physiological marker that may be measured through objective means with a view to attaining a measure of stress reduction. According to Demerouti et al. (2001), the Maslach Burnout Inventory (MBI) and Utrecht Work Engagement Scale (UWES) are important measuring tools for job burnout and employee engagement, respectively. Lastly, Tetrick and Winslow recommend using the General Health Questionnaire (GHQ), for monitoring general mental health, while the Work-related Quality of Life scale monitors well-being in the workplace.

Thus, the intervention plan designed above, along with its measures, should be implemented as follows:

Plan Component	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Nov	Dec
1.1 Pre-evaluation	X										
1.2 Improve Physical Conditioning and Support	X	X	X	X	X	X					
1.3 Post-evaluation						X					
2.1 Pre-evaluation			X								
2.2 Ergonomic Work Design and Equipment Upgrades				X	X	X	X	X	X		
2.3 Post-evaluation									X		
3.1 Pre-evaluation					X						
3.2 Adapt Working Hours and Recovery Time					X	X	X	X	X	X	
3.3 Post-evaluation										X	
4.1 Pre-evaluation						X					
4.2 Provide Training and Education on Physical and Mental Health						X	X	X	X	X	
4.3 Post-evaluation											X
5.1 Pre-evaluation						X					
5.1 Mental Health and Burnout Prevention						X	X	X	X	X	X
5.3 Post-evaluation											X

Table 2 – Implementation of the plan

In conclusion, the methods listed above should be employed at the beginning of plan implementation to form a baseline of physical and mental health, state of ergonomics, and recovery support. These baselines will also set up a database of the status of the workforce and enable targeted interventions. It is suggested that the same tools-validated self-reports, physiological tests, and observational analyses-be administered six months to one year later, starting on January of 2025, to measure the plan's efficiency. Such comparison will help the organization from the results over time to ascertain the impact of their intervention, measure improvement, and make informed decisions on further adjustments necessary for improving health, productivity, and general well-being of workers.

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Conclusion

This project reveals the dire need for strategic interventions that can deal with the physical and mental challenges faced by this group of professionals at the Oceanário de Lisboa. In this qualitative research, during in-depth interviews with 8 aquarists, some of the important issues that cropped up included physical strain from repetitive and heavy work, mental fatigue related to the responsibility regarding marine life, and lack of career growth opportunities. These are further compounded by the physical stress related to diving and habitat maintenance that commonly results in musculoskeletal disorders, particularly for staff who are older or have served longer.

The research evidence showed that even the everyday routines undertaken by aquarists, such as cleaning tanks, diving, and preparing food for marine species, were not only physically but also mentally strenuous due to the high level of responsibility required. The emotional burden linked to ensuring animal welfare, together with the need to meet functional deadlines, is added to anxiety and stress. On top of that, many of the aquarists complained about their perception over the lack of recognition of work, limited internal mobility, and lack of professional growth opportunities. These contribute to the general feeling of undervaluation, further affecting the motivation and well-being of the employees.

In the light of problems identified above, this project proposes a multilevel approach that addresses the workers' concerns in physical and mental aspects. Firstly, it will propose the introduction of ergonomic tools: electric cleaning brushes to lighten the load of repetitive tasks and posture-supporting vests to reinforce the back. Task rotation shall be performed in order not to overuse certain muscle groups to avoid possible injury. Because of this, adjusting the working hours would be particularly important for divers to have enough time to recover from work and avoid long-term fatigue.

Aside from physical intervention, this project also emphasizes psychological support. Thia programs involve mindfulness training and providing counselors to help aquarists cope with job stress and emotional burdens. In addition, this will be further help at the emotional level in handling the job more efficiently with regular mental health checks and workshops for stress reduction.

These measures are necessary to make the working environment such that aquarists feel valued, supported, and physically able to carry out their duties. By so doing, Oceanário de Lisboa will manage to improve the lifestyle of their employees by investing in their physical and mental capital, hence securing the long-term sustainability of its operations. The approach

shall be holistic towards workforce management and act as a role model for other aquariums and similar institutions in regard to balancing the two arms: conservation efforts and care and development of the human resources that support these actions.

In conclusion, this project provides a roadmap to address unique challenges faced by aquarists. These will help Oceanário de Lisboa to have a healthier and more resilient workforce, thus contributing to better well-being among employees and improved overall results of the organization. The proposed strategies here are not only vital for the betterment of the present situation at Oceanário but also highly relevant and extendable to other institutions concerned with marine conservation and education. The final accomplishment of Oceanário de Lisboa will not depend only on the concern of taking care and preserving marine life, but also on how it fosters and supports the team of professionals committed to making it a reality.

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Appendix A – Interviews 'Script

I'm conducting these interviews as part of my master's thesis project in Human Resources Management and Organisational Consulting at ISCTE. This study aims to explore issues related to physical fatigue and the well-being of aquarists.

All responses will be treated in strict confidence and the data collected will be used exclusively for academic purposes. There are no right or wrong answers, as I seek to understand perceptions, experiences and opinions about the physical challenges faced at work, as well as the strategies used to mitigate fatigue and promote well-being in the workplace.

Thank you in advance for your participation and contribution to my project. If you have any questions or concerns, I'm happy to answer them.

Topic: Introduction

1. What led you to work at the aquarium?

Topic: Physical Fatigue and Mitigation

2. What are the biggest challenges - physical/mental - of working as an aquarist? And what are the greatest rewards? (list at least two)
3. What aspects of the job can cause the most anxiety and stress?
4. What strategies can be implemented to mitigate physical fatigue?
5. What are the most physically demanding tasks and how often are they performed each day/week?
6. What equipment exists or could exist to alleviate physical effort at work?
7. Are there specific periods or times of the year when physical fatigue tends to be more pronounced for aquarists?
8. How do you deal with physical fatigue after a long, demanding day at work?
9. Are there any training programmes or exercises you would like to see provided to the team of aquarists to help improve physical endurance and reduce fatigue?
10. What changes could be made to improve the well-being and professional quality of life of aquarists?

Appendix B – Interviews Transcriptions by topics (part 1)

Participants	1. O que o levou a trabalhar no aquário?	2. Quais são os maiores desafios - físicos/mentais - de trabalhar como aquarista? E quais são as maiores recompensas? (enumerar pelo menos duas)	3. Que aspetos do trabalho podem causar mais ansiedade e stress?	4. Que estratégias podem ser implementadas para mitigar a fadiga física?	5. Quais são as tarefas mais exigentes fisicamente e com que frequência são realizadas por dia/semana?
P1	Desde cedo, desenvolvi uma paixão pelo mar, praticando desportos relacionados. O prestígio do Oceanário de Lisboa como líder na conservação marinha e as boas condições de trabalho relatadas por colegas foram atrativos adicionais.	Trabalhar com animais marinhos é uma das maiores recompensas do meu trabalho. Muitas vezes sinto que passamos mais tempo em frente ao computador. Os métodos parecem um pouco ultrapassados. Apesar destes desafios, a oportunidade de trabalhar com animais e fazer o que gosto mantém-me motivado.	Causa ansiedade saber que tenho de cumprir os objetivos anuais, especialmente quando me preocupo em ser mais bem remunerado, mas sem mais benefícios. No entanto, não sinto o stress da responsabilidade de forma intensa.	Ter a equipa a mergulhar na limpeza é uma responsabilidade enorme. A rotação nas áreas, como nas florestas submersas, é intensa, e quando mudo de área, não posso mergulhar para descansar. Alguns colegas poderiam mergulhar, mas a carga de trabalho é elevada.	O mergulho nas florestas acontece todos os dias, e é preciso usar um fato pesado, além do cinto de lastro. Antes do mergulho, faço o sifonamento do aquário todos os dias, o que leva cerca de 30 a 40 minutos. Também limpo o acrílico diariamente. Dedico 4 horas, das 6h às 10h, ao mergulho.
P2	Desde criança, sempre fui fascinado pelo mar. Esse interesse levou-me a estudar aquacultura e, em 2000, dei um passo decisivo ao fazer um curso específico e entrar profissionalmente no Oceanário. Desde então, transformei essa paixão em carreira, dedicando-me à conservação do oceano.	O trabalho físico é duro: mergulhos frequentes, máquinas pesadas, muitas escadas e superfícies irregulares, além do peso da comida e a má postura que causam desgaste. Mas a maior recompensa é a paixão pelo que faço e o amor à camisola.	Os prazos apertados para fazer as nossas tarefas, haver um grande limite nos horários é algo que me cria ansiedade, uma vez que gostava de poder fazer melhor - mas precisava de mais tempo.	Por exemplo, ter aulas de yoga e pilates. Também seria interessante ter mais tecnologia que substituisse algumas tarefas que fazemos.	Na cozinha, lido com as caixas de comida e faço a passagem para o carrinho, o que envolve um esforço constante. No laboratório, o trabalho é marcado pela repetição dos mesmos movimentos; mais do que o peso das tarefas, o que pesa é a monotonia das ações realizadas diariamente.
P3	Foi através de uma professora que descobri a paixão pelo mar e também as oportunidades que haviam de trabalhar no Ocenário, pois era um local onde me identificava	O trabalho físico dos aquaristas é intenso: levantar muito cedo, lavar os habitats, manusear máquinas de pressão e realizar mergulhos, tudo com equipamento pesado. Mentalmente, é desafiador lidar com colegas, chefias e garantir a saúde dos animais. Poder estar perto dos animais diariamente é um privilégio.	Há uns anos, sentia muito mais a perda dos animais, mas agora lido melhor com isso. Um exemplo é o caso das lontras: quando o Eusébio morreu e teve de ser feita a necropsia, percebi a situação com um pouco mais de distanciamento, embora ainda seja difícil.	O horário está razoável, mas seria ideal ter mais pessoas para distribuir a carga física. O carrinho que usávamos para transportar os alimentos para os habitats deixou de existir, e isso pesa cerca de 7 kg. Também seria bom haver mais rotatividade nas áreas e ter mais parceiros a ajudar na limpeza.	Lavar o habitat dos pinguins com a máquina de pressão é uma tarefa muito física. Realizo esta atividade todos os dias, durante cerca de 1h30. Os mergulhos ocorrem 3 vezes por semana,. Após os mergulhos, sinto-me muito cansado. A alimentação dos animais leva cerca de 1 hora, e escovar os tanques demora entre 1h e 1h30.
P4	Vim ao Oceanário fazer um estágio e adorei a experência e o local. Comecei por trabalhar com is mergulhadores e quando houve uma oprtunidade de integrar a equipa foi selecionada.	Fisicamente, o trabalho envolve mergulhar, lavar os habitats com máquinas de pressão, carregar caixas na cozinha, subir e descer escadas, apanhar animais e empurrar carrinhos. As recompensas são grandes: a ligação com os animais durante o mergulho, o impacto positivo nas pessoas ao alimentar.	A falta de reconhecimento é uma preocupação constante. Preocupo-me também com os animais que estão doentes e com o futuro: em breve, talvez já não consiga mergulhar. Além disso, a marcação de férias é sempre um momento extremamente stressante, sendo a noite de marcação a mais tensa do ano.	Haver mais rotatividade no mergulho e também haver mais pessoas para a máquina de pressão (uma das tarefas mais exigentes).	A máquina de pressão é utilizada diariamente, enquanto os mergulhos são realizados 2 a 3 vezes por semana. Essa rotina exige um bom nível de preparação e esforço contínuo.
P5	Sempre foi um sonho trabalhar no Oceanário de Lisboa. Gostava muito do mistério do que se passava por trás e tinha muita curiosidade em aprender mais.	Fisicamente, o trabalho é extenuante com muitos mergulhos e esforço constante. A frequência elevada de mergulhos exige bastante do corpo. Mentalmente, os desafios incluem a grande quantidade de tarefas burocrática. As recompensas vêm do prazer de mergulhar, o contacto com os animais e os desafios diários.	Quando os animais precisam ir ao veterinário, chego de manhã e dou uma volta para garantir que está tudo bem. Planejo fazer algo durante as folgas, mas nem sempre consigo concretizar. Além disso, a perda súbita de animais é sempre um momento difícil de lidar.	Ser possível dividir as tarefas por mais pessoas.	O mergulho acontece praticamente todos os dias, o que implica vestir e despir o fato regularmente. Na cozinha, sou responsável pela preparação de toda a alimentação. Quando entra um novo animal, é necessário remover a gaiola de 6 metros, um processo que pode demorar cerca de 4 dias para ser concluído.
P6	Desde pequeno que tive um fascínio pelo mar. Já tinha aquários em casa e havia muita curiosidade em aprender mais.	Fisicamente, andar longas distâncias, subir e descer escadas, alcançar zonas de difícil acesso e realizar mergulhos, o transporte do material é bastante pesado. Mentalmente, há sempre a pressão de ter tudo pronto até às 10h. As recompensas vêm de fazer o que se gosta e de ver o resultado do trabalho nas exposições.	Existe falta de tempo para fazer as tarefas, pois há muita coisa que é necessário fazer num tempo especifico. Ou seja, é preciso ter tudo feito em muito pouco tempo.	É importante promover a rotação das pessoas nas diferentes áreas, como nos habitats, na quarentena e nas galerias, especialmente nos pinguins. Além disso, quem faz mergulhos longos deveria poder sair mais cedo para aliviar a carga de trabalho.	Mergulhos- em 5 dias/3x semana (com frequência ter de ir mais vezes), a andar - +/- 9 km/dia + escadas. Os mergulhos são realizados em 5 dias, com uma frequência de 3 vezes por semana. Além disso, ando cerca de 9 km por dia, o que inclui subir e descer escadas, aumentando ainda mais o esforço físico diário.
P7	Sempre quis trabalhar com animais e, tendo um especial gosto pelos animais marinhos, trabalhar no Oceanário de Lisboa sempre esteve no topo da lista.	Fisicamente, o trabalho envolve grandes cargas, especialmente durante os mergulhos e ao subir e descer escadas. O movimento repetitivo de lavar e escovar. Mentalmente, a responsabilidade é enorme, sabendo que um pequeno erro pode ter consequências. As recompensas são ajudar os animais.	Temos que fazer muita coisa ao mesmo tempo, e é crucial prestar atenção a cada detalhe. É um equilíbrio constante entre realizar todas as rotinas diárias e, ao mesmo tempo, observar atentamente os animais para garantir que tudo está bem.	Ter menos mergulhos, os colaboradores melhorarem as condições físicas e poder haver um ginásio no Oceanário.	Mergulhar para limpar com uma escova de dentes acontece, no mínimo, 2 a 3 vezes por semana, podendo chegar a um máximo de 5 vezes.
P8	Sempre tive um gosto especial pelos aquários, devido a uma grande influência dos irmãos. E como qualquer pessoa que estuda e gosta do mar, o Oceanário é o Oceanário- uma referência.	Mentalmente, o desafio está na gestão do tempo, com muito trabalho para poucas pessoas, e a pressão de garantir que tudo fique bem. Fisicamente, os mergulhos frequentes exigem muito esforço. As recompensas: os mergulhos em si e a oportunidade de estar perto dos animais são as maiores motivações.	A preparação dos tanques é intensa, com muitas tarefas a serem concluídas antes das 10h. O tempo é sempre apertado, e há sempre mais coisas para fazer do que o tempo permite, o que torna o ritmo de trabalho bastante exigente.	Quem mergulha com mais frequência deveria ter mais horas de descanso, mais folgas e um horário mais reduzido. Além disso, seria bom encontrar uma solução para transportar os filtros de forma mais eficiente, com um elevador disponível em todos os pontos necessários.	Os mergulhos acontecem 3/4 vezes por semana, com durações entre 1/2 horas. Subir e descer com a areia para secar, que pesa cerca de 7kg, ocorre uma vez a cada duas semanas. Também realizamos a captura de animais, todas as semanas, o que implica lidar com cerca de 15kg.

Appendix C – Interviews Transcriptions by topics (part 2)

Participants	6. Quais os equipamentos que existem ou poderiam existirpara aliviar o esforço físico durante o trabalho	7. Existem períodos específicos ou épocas do ano em que a fadiga física tende a ser mais acentuada para os aquaristas?	8. Como gere/lida com a fadiga física após um dia longo e exigente de trabalho?	9. Há programas de formação ou exercícios que gostaria que fossem fornecidos à equipa de aquaristas para ajudar a melhorar a resistência física e reduzir a fadiga?	10. Que mudanças poderiam ser realizadas para melhorar o bem-estar e a qualidade profissional de vida dos aquaristas?
P1	Seria ótimo ter uma máquina que limpe o vidro sozinha, pois já existe tecnologia para isso. Além disso, a instalação de uma linha de ar comprimido disponível em todos os aquários ajudaria a evitar a necessidade de andar a carregar garrafas,	Não, nas férias como há mais volume de trabalho porque há mais pessoas de férias.	É fundamental incorporar exercício físico, seja no ginásio ou na piscina, para ajudar na recuperação. Aproveitar o fim de semana para relaxar e recarregar energias também é essencial para manter o bem-estar.	Atividades de team building, como yoga, pilates ou mindfulness, são ótimas para descontrair e espairecer. Além disso, seria interessante ter acesso a um ginásio, ou até um desconto no ginásio e nas piscinas, para promover o bem-estar físico e mental da equipa.	Ambiciono mais e sinto que é necessário que a empresa reconheça isso, especialmente através de uma remuneração mais adequada
P2	Um colete que proteja da postura (como já existe no leroy merlin)	Pré -férias (ansiedade das férias)	não é o fisico, mas sim o psicologico	Seria interessante ter aulas temáticas, pilates, workshops de awareness, aulas de postura. São algumas ideias.	Precisamos de mais pessoas, uma fisioterapeuta (2 vezes por semana), um ginásio adaptado às necessidades dos aquaristas e mais foco na prevenção.
P3	As esponjas e o carrinho da comida também poderia ser melhorado. Seria ideal arranjar um carrinho mais eficiente para transportar o equipamento. Na cozinha, o ralo está muito elevado, e na sala de desinfecção é importante garantir que as pendentes estão bem feitas para evitar acidentes.	Perto do final dos objetivos, há uma pressão maior para cumpri-los, e quando nos habitats chegam muitos animais. Nos pinguins, essa pressão aumenta quando estão a incubar os ninhos. Durante as férias, a situação agrava se ainda mais, pois temos menos pessoal disponível para dar conta de todas as tarefas.	não tenho tempo para mais nada	qualquer coisa para quebrar a rotina	As remunerações apresentam uma diferença muito pequena entre as pessoas que estão aqui há muito tempo e as que estão há pouco. Além disso, seria importante ter uma distinção clara nos nomes dos aquaristas (júnior, pleno e sénior).
P4	Seria útil ter escovas elétricas, semelhantes às escovas de dentes, que rodem para limpar os acrílicos de forma mais eficiente. Nos habitats dos pinguins e no T2, a limpeza deve ser feita em altura, o que não oferece segurança. Além disso, o carrinho de transporte da comida pelos habitats precisa de melhorias.	Durante o período de férias, a chegada de novos animais traz turnos malucos, além da preparação de animais para a sua saída. O nascimento de novos animais também intensifica a carga de trabalho, aumentando o trabalho por atenção e cuidados.	Algumas coisas que faço são aulas de dança/pilates, alongamentos todas as noites, tentar dormir muito e ler.	Seria bom fazermos aquecimentos, e ter um fisioterapeuta para fazermos exercicios de fortelacimento.	A marcação de férias devia ser mais aquarista-friendly, com maior flexibilidade e menos limitações. Quando trabalhamos em feriados, devíamos ter direito ao dia todo, e não apenas a meio dia. Além disso, é importante definir claramente as categorias profissionais, como aquarista sénior.
P5	na	Durante o verão, tanto antes como depois, a chegada de animais novos é um desafio. Com mais luz, os tanques sujam-se mais depressa, e a quantidade de visitantes aumenta, o que faz com que mais coisas acabem por cair na água. Isso exige um esforço extra na manutenção e limpeza dos habitats.	ter uma boa alimentação e fazer exercicio fisico.	As horas de ginástica eram ao almoço e havia uma mensalidade no ginásio. Antes de começar, tínhamos aulas de alongamento. Seria útil ter alguém a falar sobre alimentação, dietas alternativas e como manter uma boa alimentação. Palestras sobre a importância do sono também seriam muito benéficas.	Seria bom se da parte da tarde pudessemos trabalhar em casa pois existem menos coisa para fazer
P6	Ter mais elevadores a ser utiluzado pelos colaboradores e que abrangenssem todos os pisos (do lado do indico). Também gostava de ter de volta a nossa vending machine.	No Verão quando há mais pessoas de férias	fazer o minimo possível	ter um ginásio no Oceanário para fortelecimento e também termos um sitio onde pudesse estar isolado para fazer uma power nap	Deviam voltar a ter máquinas de vending, além de um serviço de refeitório. Também seria bom permitir o uso de calções. E, por favor, que não enviem emails durante as folgas e depois da hora de saída.
P7	Seria vantajoso ter uma escova elétrica para facilitar a limpeza. Além disso, um suporte digital, como um tablet, para consulta de informações durante o trabalho, seria muito útil. Também poderia ser interessante ter um tipo de mochila para carregar os filtros, tornando o transporte mais prático e eficiente.	na	Descansar e, quando possível, fazer exercicio fisico.	ter um ginásio, e seria ótimo ter aulas com alguém especializado em fortalecimento, focando nas zonas mais exigentes do corpo. Além disso, aulas de alongamentos seriam muito importantes para prevenir lesões e melhorar a flexibilidade.	Deviamos voltar a ter a vending machine e também ter acesso a um psicólogo (dentro ou fora do oceanário)
P8	Gosta de ter uma alternativa para levar os filtros (porque têm de passar pelo publico), uma sscova que o António Vitorino está a experimentar (elétrica) e ainda umas sscadas para colocar nos tanques para ajudar a sair.	É sempre mais ou menos igual. Talvez no Verão seja o período com mais trabalho, porque temos menos pessoas.	Estar com os amigos e desligar do trabalho, dormir/desacnsar e, quando consigo ir ao ginásio (ia no passado e sentia me muito melhor)	Ter ginásio, além das aulas, seria fundamental ter um psicólogo ou terapeuta disponível, alguém com quem falar. Também seriam úteis formações sobre postura e palestras com fisiatras para ensinar a forma correta de levantar pesos.	Seria importante reduzir o horário de trabalho e oferecer regalias para quem mergulha muito. Também é necessário receber mais e permitir que as pessoas mais velhas se reformem mais cedo. A instalação de um ginásio com aulas de fortalecimento seria uma ótima adição.