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VATICAN MUSEUMS' ACCESSIBILITY PRACTICES FOR BLIND AND PARTIALLY SIGHTED (BPS) VISITORS: A CASE STUDY

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***Abstract*:** The Vatican Museums (also referred to as "VM") are the repositories of one of the world's most remarkable and varied art collections. The relative responsibilities and challenges are plenty: the many visitors pose a significant threat to the conservation of artworks, but communicating and safeguarding the works of art is even more challenging when opening the museum collections to a Blind and Partially Sighted (referred in the article as BPS) audience. The Vatican Museums' accessibility practices, some of which aimed at providing support to the experience of visually impaired visitors, have been developed via foresight, international vision, strong partnerships, and efficient resource allocation.

The present article describes the strategies adopted by the Vatican Museums involving accessibility for BPS audiences. It examines the extent of existing measures and how they align with the "best practices" necessary to grant access to facilities and valuable information. The analysis has been carried out through first-hand observations performed during the internship period the author spent at the Vatican Museums. Finally, the article examines the educational techniques involving some of the items included in the haptic itinerary offered by the Vatican Museum, with references to applied neuroscientific research in relation to tactile perception and Museum Sciences.

Keywords: museum education, museum studies, accessibility, Vatican Museums, BPS, empirical aesthetics.

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Introduction

Getting in touch with culture can be considered a fundamental experience for a person's development and subsequent integration into society. However, visual impairment often appears to be an insurmountable obstacle when accessing culture and art because of the inherent visual approach linked to sharing and communicating content in museums. Classen & Howes (2006) highlight how touch and proprioception were once appropriate means for experiencing a work of art, particularly when museums were reserved for a social elite. However, ever since museums opened to the general public there has been an increasing abstention from aesthetic perceptual modalities other than sight (Classen, 2012; Candlin, 2008).

The prejudice of inaccessibility to cultural heritage for Blind and Partially Sighted (henceforth referred to as BPS) people is shared by many. Yet, the efforts undertaken to understand visual impairment have fortunately provided essential contributions to reflect on how best to communicate art and culture to this specific population. The present study proposes that objectives and specific measures have to be considered in order to improve the accessibility of museum structures; not limited to physical access, it’s important to establish effective museum typhlodidactics (i.e. education aimed at BPS visitors), potentially employing the insights offered by empirical aesthetics to understand the specific perceptual and learning needs of BPS people.

Research objectives

This article is presented as a case study. Its purpose is to illustrate the practices for BPS-specific accessibility and education employed by the Vatican Museums. The analysis aims to show how, through networking and focusing efforts and resources, it is possible to open a museum to everyone, shaping effective educational programs. At the same time, it is important to keep these strategies up-to-date and in line with the latest research and best practices.

The review of the accessibility methodologies employed by the Vatican Museums took place via first-hand observation, with consideration to the current "best practices" (Pressman & Schulz, 2021; Tiberti, 2020; Paschetta, 2003; on website

accessibility, Bahram, 2021) and typhlodidactics studies (Secchi, 2004; Grassini, 2015; Grassini, Socrati & Trasatti, 2018; Piscitelli et al., 2010). Finally, a few neurophysiological studies are referenced to support the relevance of understanding the mechanisms underlying the perception of BPS people (Chatterjee, 2008; Levent & Pascual-Leone, 2014). However, this research perspective would benefit from further investigation.

Structure of the article

The first part of the article briefly analyses visual impairment: its features, its proportional impact on the world population, and an estimate of its growth. Here are also described the types of barriers (structural, psychological, and social) that must be considered when designing accessibility strategies for BPS people. Finally, the role of the modern museum in cultural heritage communication is briefly assessed. The focus will be on the Vatican Museums, outlining their mission and network of relationships with professionals, institutions, and associations.

The second part lists a series of measures adopted by the Vatican Museums to make facilities and information accessible vertically, i.e. from planning the visit until after leaving the museum. The analysis will highlight strengths, challenges and some of the author's suggestions.

The third part showcases four items included in the itinerary for BPS visitors offered by the Vatican Museums. The items listed in this article have been hereby selected for their uniqueness and high pedagogical value (Isabella Salandri, personal communication). However, they comprise only a fraction of the items in the educational itinerary. In this section there are also some suggestions regarding the integration of neural correlates to the haptic perception that can be acknowledged when designing an educational museum itinerary for BPS people.

Section 1: General Assessment

For BPS people, as for the general public, visiting a museum under the appropriate conditions has the potential to be an enriching moment on many

fronts. BPS visitors can learn about culturally relevant artefacts, interact with other people, and avoid isolation. No less important is the opportunity to engage in pleasant experiences with the collections in a multisensory way, which could lead to a better understanding of the artworks. This has been linked to increased self-esteem and confidence in one's abilities (Small, Darcy & Packer, 2012). In the following sections, we will briefly disclose the characteristics of visual impairment, and the approach of the Vatican Museums to accessibility.

Visual Impairment: Statistics and Barriers

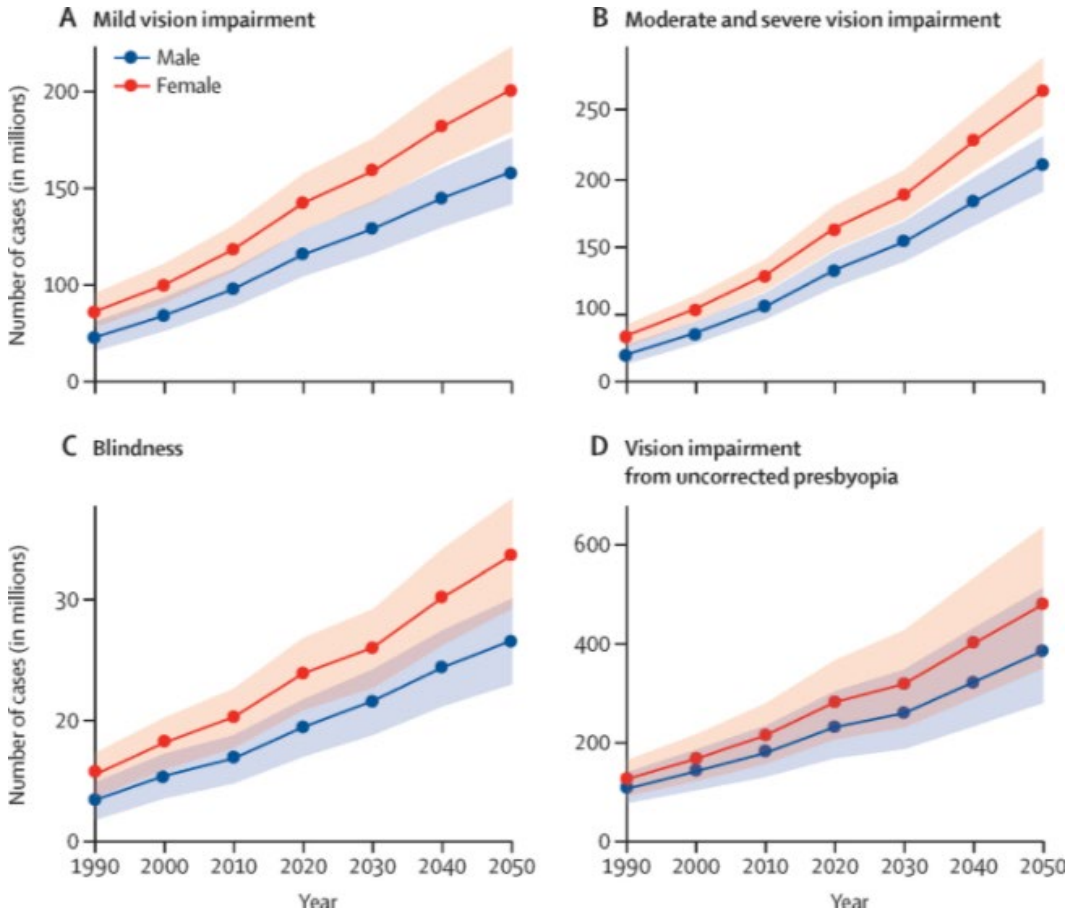
Statistical Analysis

The various degrees of visual impairment are classified in the International Classification of Diseases 11 (Fricke et al., 2018), dividing BPS people in two groups: “distance” and “near”. The different degrees of visual impairment, measured in visual acuity (referred to as v.a.), are: **mild** (v.a. worse than 6/12 to 6/18), **moderate** (v.a. worse than 6/18 to 6/60), **severe** (v.a. worse than 6/60 to 3/60), and **blindness** (v.a. worse than 3/60). Near vision impairment comprises individuals whose v.a. is worse than N6 or M.08 at 40cm. According to the World Health Organization (2021), a person’s experience of visual impairment relates to several different factors (e.g. whether the person has undergone rehabilitation or problematic access to buildings, transport, or information).

In order to understand the population-related impact of blindness in quantitative terms, as part of the World Health Organization's “VISION 2020: The Right to Sight” initiative, the Lancet Global Health has conducted a meta-analysis of statistical surveys (Bourne et al., 2021). The surveys, produced between 1980 and 2018, investigated the incidence of visual impairment worldwide, predicting the future impact of blindness on the world's population. The results of the study showed that, by 2020, approximately 43.3 million people were blind, 295 million had moderate and severe visual impairment, and 258 million had mild visual impairment. Globally, between 1990 and 2020, visual impairment due to old age (over 50) decreased by 28.5%. In contrast, severe and moderate visual impairments increased by 91.7%, while the number of people with blindness increased by 50.6%. The meta-analysis estimates that there will be 61 million blind people in 2050, while 474 million will have severe, moderate, or mild forms

of visual impairment (Figure 1). Considering the increase in the visually impaired population projected by this study, the present article suggests that enhancing accessibility in general, including museums and cultural facilities, may be a worthwhile investment.

Figure 1. Prediction of the number of people affected by mild vision impairment (A), moderate and severe vision impairment (B), blindness (C), and vision impairment from uncorrected presbyopia (D), all ages by sex, 1990-2050. Source: Bourne et al. (2020)



Barriers faced by Visually Impaired People

According to the "social" model of disability (Oliver & Barnes, 2010; Bolt, 2005), individuals have physical disadvantages due to various psychophysical reasons, but only for society this is identified as disability. In this sense, disability is not a functional limitation, but a consequence of external barriers that preclude full access to society. Some of the main challenges that BPS people face when participating in social activities are related to the physical features of the

environment. Specifically, architectural barriers can cause locomotion difficulties during exploration (Agostiano, Baracco, Caprara, Pane & Virdia, 2009). Limited familiarity with an unknown area is also likely to cause anxiety and insecurity, especially if a location is visited without a companion (Richards, Pritchard & Morgan, 2010).

The studies above suggest that, for BPS people, barriers can take many different forms, ranging from physical and psychological to social limitations. Those involved with accessibility should broaden their knowledge and skillset: be aware of both physical and psychological challenges, research the specific needs of people with disabilities, study accessibility measures in an ecologically valid context, and ensure a high level of training for staff and service providers.

Vatican Museums' commitment to accessibility

General Features

According to the latest Statute of the International Council of Museums (ICOM), adopted during the Extraordinary General Assembly held in Prague on the 24th of August, 2022, "*A museum is […] Open to the public,* ***accessible and inclusive****, […]. They operate and communicate […] with the* ***participation of communities****, offering varied experiences for* ***education****,* ***enjoyment****,* ***reflection and knowledge sharing****.*" (ICOM, 2023, emphasis added). Currently, then, the value of a museum is expected to depend not only on the scientific and historical relevance of the exhibits, but also on factors such as accessibility and enjoyment of the content, and how this content is delivered.

The Vatican Museums have a long and rich history, inextricably linked to the social and political events that have taken place in the world. The '*Museums of the Pope*' are addressed in plural because of the complexity and variety of their structures and collections. They embrace the task of "*making known, preserving and sharing that extraordinary legacy of culture, history, and beauty that the Roman Pontiffs have collected and safeguarded for centuries*" (Jatta, 2022). As is the case with the modern museum according to the ICOM definition (2023), the Vatican Museums embody, among other beliefs, the responsibilities of preserving

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and exhibiting culturally relevant artefacts. However, the mission of the museum is also to welcome and connect people through its collections.

Removing barriers

The Vatican Museums admit a considerable amount of visitors every year: in 2019, before the Coronavirus pandemic, the estimate reached almost 7 million people (Marroni, 2020). Consequently, to open the VM effectively, two major issues must be considered: conservation and fruition. The objective must be not only to passively open the museum collections to visitors, but to establish active welcoming strategies by meeting the needs of different target groups. In this sense, efforts in opening the collections are not only directed in favour of the general public, but also to specific prospective audiences. This necessarily calls for the close collaboration of multiple experts hailing from different fields: from restoration and conservation laboratories, to history and architecture departments, including administrative offices. Combining different professional backgrounds contributes to making the Vatican Museums' educational programs accessible so that the principles of conservation harmonize with museum education.

Modifications in the architecture and the collections have occurred in different moments during the centuries, reflecting diverse cultural backgrounds. The Museo Gregoriano Profano, one of the “Classics” Departments in the Vatican Museums, is of great interest for this analysis. The collection of marble sculptures themed around Graeco-Roman mythology and history was made accessible to visually impaired people in the 1990s.

External collaborations

A long-lasting rapport exists between Vatican Museums’ Department of Education and Accessibility and several associations that locally engage with the BPS community, including the *Federazione Nazionale delle Istituzioni Pro Ciechi di Roma*, and the *Associazione Museum*. The latter has been involved since the 1990s in conducting tours for the visually impaired in the Museo Gregoriano Profano and in the Sistine Chapel (Tiberti, 2020: p.205).

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Of major relevance is the partnership with the *Istituto dei Ciechi Francesco Cavazza* in Bologna, which also hosts the remarkable *Museo Tattile Anteros*. On several occasions, the Institute has produced educational supports for visually impaired visitors in the Vatican Museums. This includes the creation of 3D tactile reproductions of two major paintings, specifically Caravaggio's *Deposition*, and Raphael's *Transfiguration*. In 2011, the Chief Accessibility Officer of the Vatican Museums, Ms. Isabella Salandri, implemented innovative multisensory educational itineraries that feature these tactile supports.

Section 2: Access to Facilities and Information

Analysis of barrier removal solutions in the Vatican Museums

We will present here the different methodologies employed by the Vatican Museums aimed at enhancing the accessibility of facilities and information for BPS people "vertically" (i.e. from beginning to end, starting from gathering information on the web, up to the conclusion of the visit). In some cases, the solutions listed are accessible "horizontally" (i.e. across several disability categories: visual, auditory, mobility, and mental disabilities).

These strategies for accessibility are being regularly revised and updated, and each point is analysed below:

Official Website

The Vatican Museums' website (Vatican Museums, 2023) includes several specific information for visitors with disabilities, delivered in Italian and English. The contents are accurate and offer proper assistance to those wishing to obtain helpful directions for accessing the facility and planning a visit.

However, website browsing is obstructed by unwise graphic design, which also lacks accessibility adjustments. In order to improve the website, it may prove beneficial to review its design. A few suggestions include: enlarging the texts, making the colour contrasts more pleasant and less sharp, and grouping the information more straightforwardly. Following the example of other museums, such as the Rijksmuseum in Amsterdam (Rijksmuseum, 2023), a section

highlighting the best times of the day to plan a visit might be included. Also, it would be ideal to address museum areas with loud noises, excessive stimuli, or crowded rooms.

E-mail address

In addition to the information on the official website, it is possible to contact the back office by phone or e-mail, by writing to *education.musei@scv.va*. The back office is responsible for clarifying doubts visitors may have about educational visits and accessibility, and organising complex tours such as customised visits, or groups with a large number of visitors with disabilities.

Having a dedicated e-mail address can be of great benefit for the inclusion of the visually impaired person, as personal contact and planning are initiated. It is important to denote that this assistance to visitors with disabilities is offered directly by the Chief Accessibility Officer, who can therefore carefully organise visits for users with different needs.

Visitors' Entrance

Visitors with disabilities of any kind can access the Vatican Museums via the reserved entrance in Viale Vaticano, without making an online reservation unless they choose to take a guided tour. Skipping the line, they are referred to the Special Permits Desk in the lobby of the Vatican Museums. This desk is dedicated to assisting people with disabilities and other special or general needs.

If a guided tour has been scheduled with the Office for Services and Public Relations (*Ufficio Servizi e Relazioni con il Pubblico*, also known as USRP, translation added), visitors with disabilities will be welcomed by the Educational Operator. The course of action for the entrance is made easier by streamlining procedures, benefiting from the large waiting hall.

Tours and Educators

The educational guided tours, offered free of charge in a limited amount by the Direction of the Vatican Museums to BPS visitors who make such request, are organised and carried out, in most cases, by the person in charge of accessibility, Ms. Isabella Salandri. Following the numerous requests for accessible educational

tours, a staff of specialised museum educators has been personally trained by Ms. Salandri.

This service is fully paid for by the Vatican Museums, offering a limited number of free guided tours for people with disabilities. Although it may not be viable for most museums with fewer financial resources, it is recommended nonetheless that tours for BPS visitors be made available for any museum, in accordance with its profile and collections. Recruiting education specialists and making their prices affordable for BPS visitors is also recommended. This would be helpful in order to accommodate frequent financial constraints, a common problem for disabled people (Frick & Foster 2003).

Tactile Path Indicators and Maps

The entrance hall of the Museums has been equipped with tactile pavings, i.e. a system of textured ground surface indicators, designed by the museum's technicians and produced together with local associations involved with accessibility. The Vatican Gardens are also provided with a tactile map provided to the visitor by the museum guide during the tour (the Gardens cannot be visited without an authorized Vatican Museums' guide); a tactile map illustrating the entire Vatican City State is also available.

The Vatican Museums' areas are often historically significant, and the surfaces are subject to conservation concerns. In the current state, it is therefore impossible to implement tactile paving in the areas where most collections are displayed, due to the risk of floor damage. In general, though, tactile orientation aids can greatly help BPS people (Jain, 2014), as the visitor can create their own mental space, thus increasing their ability to move around, also supported by human guidance. The implementation of alternative solutions, digital or else, could be beneficial.

Breaking Down Architectural Barriers

Strategically placed throughout the Vatican Museums are lifts, ramps, moving platforms, and escalators. This enables total accessibility to almost all areas of the Museums for visitors in wheelchairs or with walking difficulties. The oldest lift dates back to Pope Pius XI Ratti and is located at the original 20th-century

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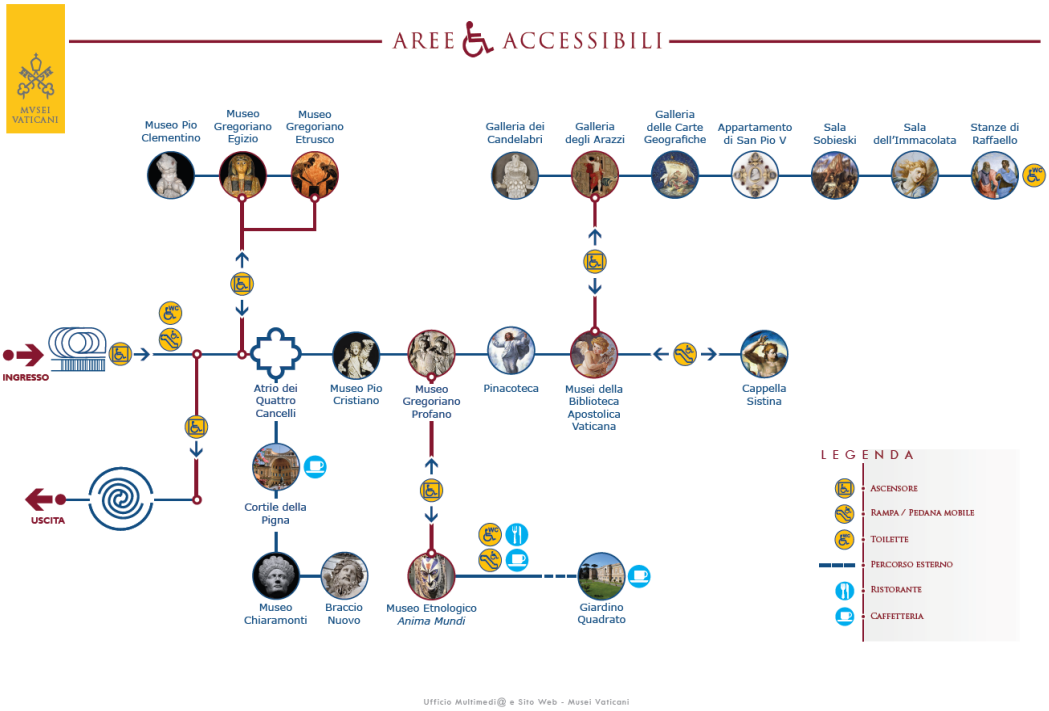
entrance to the Vatican Museums. In 2021, the newest lift was installed, leading from the Cortile delle Corazze to the Museo Pio-Clementino, Museo Gregoriano Egizio and Museo Gregoriano Etrusco levels. On the website of the Vatican Museums, a virtual map displaying the accessibility of the different areas (Figure 2) can be downloaded, and a hard copy is available at the ticket office on-site.

Figure 2. Map of Vatican Museums' accessible areas. The positioning of lifts and ramps is represented in a stylized way. The path connecting the various areas can also be identified. Source: Vatican Museums' official website. Retrieved March 31, 2022.



Lighting

The lighting in the VM is subject to several conservation concerns. The entrance and most of the rooms included in general itineraries are well lit. However, the luminosity, especially in areas where paintings and frescoes are exhibited, must be kept within specific parameters to ensure proper conservation. Lighting in other more challenging areas, especially the Tapestry Gallery, must be kept to a minimum to allow for adequate conservation of the artworks. If a companion is not available, BPS visitors can carefully hold to the handrails in the gallery and arrive in the next section.

Fast priority pathways

As tactile exploration requires much time, following quick routes to access more distant yet relevant areas becomes necessary. The Vatican Museums are in part composed of long galleries. A fast route can be used to reach some areas of great interest that are difficult to access, such as the Sistine Chapel. For example, to use the special route to the Sistine Chapel, Educational Operators who lead people with disabilities are allowed to walk through the Lower Galleries, which is normally the outflow area for visitors exiting the Sistine Chapel. Thus, in addition to avoiding an extremely long route, it is possible to circumvent the numerous steps and stairs of the regular itinerary.

Vatican Gardens

Since 2015, the Vatican Museums allows special access to BPS people who wish to visit the Vatican Gardens. This tour is free of charge and can be booked via e-mail, if available. The tour, led by a specialised guide, features art-historical, naturalistic, and anecdotal explanations. The visit is complemented by the multimodal natural ambiences, including sensations such as seasonal smells and auditory stimuli. In addition, the Educational Operator is equipped with a tactile handbook, i.e. an educational support consisting of large-format cards, produced in collaboration with the Federazione Nazionale delle Istituzioni Pro-Ciechi and Mr. Paolo Luzzi, Director of the Giardino dei Semplici in Florence. The book is written both in Braille and in enlarged letters (black lettering on a white background to create a strong chromatic contrast). The texts also include bas-relief drawings or layouts, with very simple and stylised outlines, and vivid colours specifically for the visually impaired with residual sight.

Section 3: Fruition of the artworks and guided tour

Origin and Features of the itinerary

The Vatican Museums launched their BPS accessibility program in the 1990s, when it was possible to explore some specially selected original marble sculptures haptically. In 2011, the educational offer for BPS people was improved with an innovative multi-sensory itinerary in the Vatican Pinacoteca, including bas-relief

reproductions of some relevant paintings. The itinerary has incorporated the Anima Mundi Ethnological Museum, including casts of the god Tu and Quetzalcoatl's statues, and the Pio-Cristiano Museum (Touching Art initiative). Since 2015, a multisensory itinerary has been open in the Vatican Gardens, which also made use of a tactile book with thermoformed tables and bas-reliefs, as well as text in Braille and black with enlarged characters.

The tour offered by the Vatican Museums to BPS visitors is intended to meet their cognitive and learning needs. Educational methodologies inspired by Montessori and Munari's sensory pedagogy (Munari, 1985; Montessori, 1935) are also employed. Additionally, Operators refer to Panofsky's (1961) tripartite method (pre-iconographic, iconographic, and iconological level) which dissects an image through the stratification of cognitive levels.

The typhlodidactic methodologies have been explored in theory and practice by Loretta Secchi (2004), curator of the *Anteros Tactile Museum of Ancient and Modern Painting* at the Istituto dei Ciechi Francesco Cavazza, in Bologna. Her work focused on the learning specificities of BPS people interacting with art and culture. A deep understanding of visually impaired perception can be extremely useful when developing an educational program. In this respect, an empirical aesthetics approach can provide valuable insights on the reactions of BPS people to different stimuli, informing the establishment of appropriate environments and educative techniques. It is hereby proposed that research in this field is potentially relevant if properly performed. The main objective continues to be respecting the BPS and their personal specificities, and experimenting both in a clinical environment and in ecologically valid ones such as museums.

Objectives of the analysis

The typhlodidactic strategies employed differ for each selected artwork, and every piece has been chosen according to its pedagogical value. Currently, the tactile copies are positioned adjacent to the original artwork. They are also placed in calmer areas and, thus, more enjoyable for BPS people sensitive to noises. Since a large number of people visits the Vatican Museums, it is advisable that the tour take place in spaces where crowds are unlikely to form and where the noise resulting from large gatherings does not disturb the haptic visits.

The following table lists some of the most relevant items in the Vatican Museums' tactile multisensory itinerary (Table 1).

Table 1. A list of some items in the tactile multisensory itinerary of the Vatican Museums, the name of the item, its location inside the Vatican Museums/Vatican City State, and the material or attributes important for the communication of the item to the visually impaired audiences.

N.	Name	Location	Material and attributes
1	Athena and Marsyas	M. Gregoriano Profano	Marble and gypsum
2	Deposition	Pinacoteca Vaticana	3-D perspective bas-relief
3	Sistine Chapel	Sistine Chapel	Architecture and images
4	Vatican Gardens	Vatican Gardens	Multisensory pathway

These items are thought to fully achieve the conjunction of pedagogical and aesthetic apparatus. The study was performed via direct observation of the educational activities carried out by specialised Educational Operators, and by first-hand application during BPS guided tours. The aim of the analysis is to highlight the key features of educational typhlodidactics methodologies used in the tactile itinerary of the Vatican Museums.

Item n.1: ATHENA AND MARSYAS (marble and gypsum sculptures)

The group of sculptures, Athena and Marsyas, shows the moment when the goddess, after throwing the 'aulòs' flute to the ground, surprises Marsyas, who is just about to pick it up. The sculpture of Athena (a 19th-century gypsum copy) is remarkably different from Marsyas' (an original 1st-century Roman sculpture in Pentelic marble): while the goddess is austere, the satyr is instead frozen in a very dynamic pose. Touching an original sculpture, if properly performed, can cause an emotional reaction in visitors, thus enriching the experience with emotional significance (Bacci & Pavani, 2014). It is imperative that, prior to touching original marble sculptures, hands are sanitized or, preferably,

thoroughly washed. The reason for this is to prevent bacterial growth and salt crystallization on the artwork, which harms marble (Doehne & Price, 2011).

Item.1 - Phase 1

Firstly, the Operator briefly recounts the myth. During the narration, a short audio extract of the sound of the aulòs flute, central to the story, is usually played. This facilitates imagining the context of the myth by using the auditory and emotional sensory pathways, which may fit well together in storytelling.

The following step is to convey the composition of the sculptures through words, to start building the image in the visitor's mind. Geometric coordinates should also be provided to guide the mental reconstruction of the composition (Secchi, 2004: p.90). During this phase, it is thought that proprioception can be stimulated (i.e. the bodily sensation originated by direct stimuli to muscles and tendons). The BPS visitor's body is first positioned in a stern pose imitating that of Athena; right afterward, the procedure is repeated to emulate Marsyas' complex and dynamic pose. This is done so that it is the body of the visitor itself that provides proprioceptive feedback on the position of the sculpture, allowing the user to understand it more quickly and on a deeper level.

Item.1 - Phase 2

The following phase is carried out through active tactile exploration performed by the user. It is essential that the Operator guides the exploration, at least initially, by applying their hands over the visitor's and facilitating the perceptual analysis. The criteria for the methods to be adopted during this visit are many and elaborate, stemming from extensive typhlological studies (Secchi, 2004). The first thing to be done during the tactile exploration is to achieve an all-round reconstruction of the whole figure. For the purposes of this exhibition, hand-to-hand contact can be of great interest, creating a link between the guide and the user. In fact, the contact between the hands can be invested by emotional significance thanks to the afferent C-Tactile (C-T) fibres on the back of the hand (Vallbo, Olausson, Wessberg & Norrsell, 1993; Ackerley, 2022; Watkins et al., 2021). Affective tactile fibres are located where the operator's hands are applied, and it is here proposed that this gives an emotional framework for the visit, especially if acquaintance has been initiated prior to the start of the visit.

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The BPS user relies on the guide who, with the right timing, accompanies the tactile exploration using words, which must never contradict what is being touched.

One of the peculiarities of the Athena and Marsyas sculpture group is the difference in materials: while Athena's gypsum is smooth and maintains a tepid temperature, Marsyas' marble sculpture reveals to the touch its cold, rough but well-worked texture. The different thermal sensations contribute to developing the narration, especially the marble. Exploiting the differences between the materials, perceived through slow tactile exploration (Deibert, Kraut & Kremen, 1999), could reveal interesting brain interactions in an ecologically valid study.

Item n.2: DEPOSITION (3D perspective bas-relief)

The Deposition, an early 17th-century painting by Caravaggio, is not only of great relevance for art history, but it is also exceptionally well suited to being translated into 3D perspective bas-relief for a BPS public: this may be due to the simple geometries of Caravaggio’s compositions, or to some of the figures seemingly breaking out of the canvas. The 3D translation of paintings requires a great deal of attention to detail, but also a necessary simplification of information that, haptically, would hinder rather than facilitating the shaping of a mental image (Secchi, 2004). A careful work of analysis during the production of this piece has been carried out by the Istituto dei Ciechi Francesco Cavazza (Figure 3).

Figure 3. The three-dimensional perspective bas-relief of Caravaggio's "Deposition" is positioned by the side of the original artwork. The bas-relief is placed on a stand that can support the weight applied by the person performing the haptic exploration. The bas-relief has a high elevation, favouring a reconstruction of the shapes in the user's mind.

Item.2 - Phase 1

The user is first eased into the context of Caravaggio's artwork, including a description of the pyramidal composition and the articulated positioning of the mourning participants. This is followed by a rich oral description of postures, expressions, and details. During the first description, if considered appropriate by the Operator according to the type of audience, it is possible to make the user touch some fabrics of the kind worn by characters in the painting, as well as a fragment of painted canvas manufactured by the Laboratorio di Restauro Dipinti (Paintings Restoration Lab) of the Vatican Museums. Characteristic smells and sounds can also be made available to the user.

It is also important, at this point, to give spatial coordinates, indicating the size of the painting and the position of certain pictorial elements that seem to emerge from the surface of the canvas, typical of Caravaggio's style. In this phase, the objective is to reconstruct in the user's mind the composition that, once abstract, will become tangible. An in-depth study is necessary to understand whether exploiting the parallels between the neural substrates common to touch and sight

(Amedi, Jacobson, Hendler, Malach & Zohary, 2002; James et al., 2002), would help to create a mental image of the painting perceived haptically.

Item.2 - Phase 2

The tactile exploration of the Deposition requires a relatively long time, due to the numerous details (wrinkles, drapery, facial features, and so forth) perceivable through fine touch. The Operator's presence is necessary to slow down the visitor's often curious and dynamic approach. A relationship of trust has to be established through emotional contact and narrative skills so that the BPS person can rely on the guide and successfully unravel the complex details of the 3D bas-relief.

The role of memory is essential at this stage. Since there are many figures in complex poses, it is necessary to trace the outlines of the characters several times during the analysis to consolidate the memory of their position and, consequently, the way they interact with other figures. Since tactile information stimuli are continuously provided, it is necessary to ensure that the position of the characters has been assimilated by the user, retracing their outlines if necessary.

Item n.3: SISTINE CHAPEL (architecture and images)

The Sistine Chapel plays a vital role in the experience of many Vatican Museums visitors. Reaching this unique, large environment and having the privilege of perceiving this overwhelming example of human greatness and ambition, is for some people the pinnacle of their visit. In communicating the Sistine Chapel to a visually impaired audience, the most effective tool is emotion which, if combined with good storytelling, passion, and creativity, can compensate for the large amount of information precluded to touch.

Item.3 - Phase 1

Being a place of worship, it is not possible to explain inside the Sistine Chapel. Its description is given to all visitors in areas equipped with analogical and virtual panels. Usually, in the ordinary guided tours for the general public, This happens

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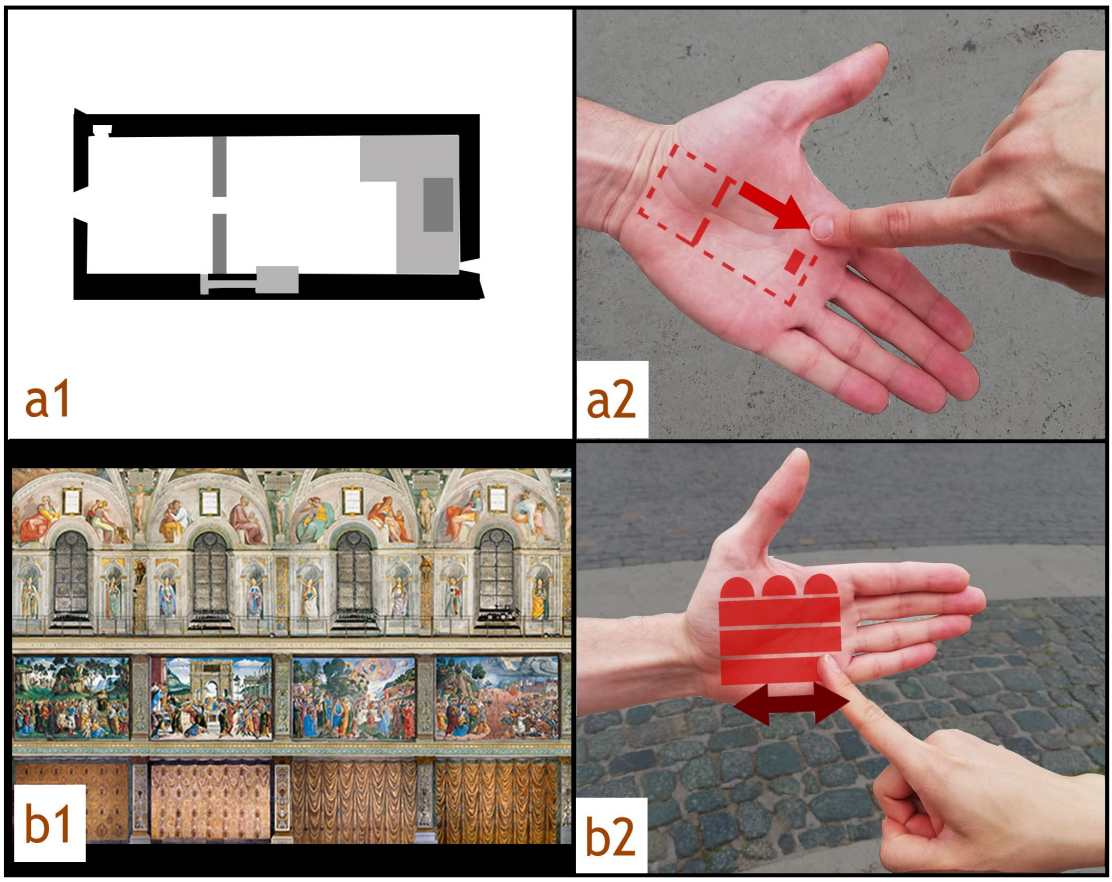
at the beginning of the visit, before carrying on to the different areas inside; the visitors then reach the Sistine Chapel on their own.

In the case of BPS visitors, the tour to the Sistine Chapel must be guided by complex descriptions that also make use of proprioception and interoception (i.e. the perception of the physiological condition within the body) to understand the proportion of the spaces, the artistic and physical efforts of the artist (thus exploiting the visitor's empathy) and the positioning of some of the most relevant figures.

The Sistine Chapel features an immense amount of images, and it is implausible to include them all in the description. It is suggested to proceed thematically, explaining the figurative program and providing historical and theological context. It is then appropriate to make the visitor understand the architectural space. In this phase, the Operator can use proprioception and an orderly description of both real and painted architecture: BPS visitors can understand the layout of the Sistine Chapel with the Operator outlining it on the palm of their hand (Figure 4, a). After hearing out the experts' opinions and through personal experimentation, a similar methodology was applied to the parietal fresco figurative program (Figure 4, b) and Michelangelo's Ceiling. However, this the efficacy of this experimental methodology still requires further investigation. Using this methodology, the Operator can also emphasize specific positioning or showcase the layout of the figures. This is a cheap and useful method that can be applied to almost any layout, as long as adequately guided and explained. Finally, prominent artworks created by Michelangelo are described via a rich narration and proprioception to understand the powerful poses of Michelangelo's monumental figures.

Figure 4. The architectonic layout of the Sistine Chapel (a1) can be outlined on the palm of the visitor's hand, positioned parallel to the ground (a2). The structure of the figurative program (b1, in this instance a section of the north wall. Source: Vatican Museums' official website. Retrieved April 30th, 2022.) can also be outlined on the hand, positioned perpendicular to the ground (b2).



Item.3 - Phase 2

Inside the Sistine Chapel, as an exception for visitors with disabilities, Educational Operators for BPS visitors are allowed to carry out simple explanations, although always respecting the sacredness of the place. It is thus possible to help the user position themselves in the space, building their own mental spatial map making use of the coordinates provided by the Operator. The latter, via tactile-plantar guidance and proprioception, guides the mental and physical elaboration of the environment. In the Sistine Chapel, if considered appropriate by the Custodian Staff, it is possible to touch the Cosmatesque floor, the High Altar, and the original sixteenth-century doorway leading to the Sala Regia.

Item n.4: VATICAN GARDENS (multisensory pathway)

Many visitors to the Vatican Museums disclose an interest in the Vatican Gardens, which cover 23 km^2 and cover more than half of the surface of the Vatican State. The Gardens are open to the public prior reservation and can be included in a tour itinerary. In addition to the "Gardens without Barriers" type of guided tour, specifically for people with reduced mobility, it is also possible to organise free guided tours of the Gardens for BPS people. The visit to this cultural site is an excellent example of how to exploit a multisensory resource already available in the museum complex.

Item.4 - Phase 1

The visit to the Vatican Gardens allows visitors to stroll here surrounded by nature's season-specific stimuli. The visit is therefore naturally enriched by the splashing of water in the numerous fountains, the chirping of birds, the rustling of leaves, the scent of aromatic plants, the smell of rain, and so forth. All of this is accompanied by interoceptive stimuli, as the visit is articulated along a walk through the Gardens. The multimodal stimuli are therefore an integral part of the route and are consolidated in the memory as they accompany the user throughout the visit. A walk through nature, art, and history also improves the mood of the visitors, who are hoped to return to the Vatican Museums with renewed interest.

Item.4 - Phase 2

A tactile book can also be used to complement the multisensory itinerary and the words of the Operator, who recounts anecdotes and describes the works of art encountered. The book is composed of thermoformed tables and perspective bas-reliefs, featuring texts in Braille and in black with enlarged characters; it is produced in collaboration with the Federazione Nazionale delle Istituzioni Pro-Ciechi, and Dr. Paolo Luzzi, Director of the Giardino dei Semplici in Florence. The book contains brief historical notes and several prospects and layouts of the buildings encountered in the Gardens. The bas-reliefs are accompanied by rich descriptions and the chance, where possible, to perceive details of the original structure haptically. The bas-reliefs have proven to be useful to BPS visitors: the supports help BPS create a mental image of what is described and of what they

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perceive haptically. Consequently, the inability to touch large buildings in their entirety is compensated.

Results

The measures to favour BPS accessibility in the Vatican Museums show variety and attention to detail. This case study analysis reveals reduced attention to the deployment of more technological measures for accessibility in favour of an analogical approach. However, one finds a significant reliance on the role of educational professionals and human contact, in line with typhlology studies (Secchi, 2004; Grassini, 2015). The interactive collaboration between experts, associations, and institutions has also proved to be an effective strategy for creating highly comprehensible typhlodidactic methodologies. Lastly, a frequent restoration of artworks and modernization of spaces inside the Vatican Museums can be seen. Thanks to the work of restorers and architects, and to the financial support of the *Patrons of the Arts in the Vatican Museums*, it was possible to eliminate most architectural barriers and make the VM more accessible.

These efforts, aimed at opening the museum and its collections to BPS visitors have endorsed the inclusion of the Vatican Museums in the international network of accessible museums (Isabella Salandri, personal communication). The accessibility objectives in the VM seem to be preserving and protecting artefacts and environments, providing access to areas and information, and developing specific educational projects.

As can be observed from the article, accessibility in the VM is fostered by considering the following guidelines:

- opening of the museum to all possible audiences;
- guaranteeing the competency of the employees who are directly or indirectly involved with accessibility;
- favouring interaction between different specialists within the museum;
- developing a solid network with accessibility-related institutions (such as other museums, associations, Patrons);
- continuously updating strategies to keep up-to-date on best practices;

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- designing a varied, well-codified, and creative educational program that enriches the user's experience.

Conclusions

What can be inferred from the analysis of the Vatican Museums' accessibility strategies is that, by directing efforts appropriately, it is possible to open a major museum, mostly considered visually-centred, to BPS people, providing also efficient accessible museum education. However, it is important to keep one's strategies up-to-date and in line with the latest research and best practices. The incorporation of these guidelines as a whole could be instrumental in the development of appropriate museum accessibility.

Museums need to open their collections to BPS users, who are not prevented from enjoying works of art that most people consider only recognizable through sight. Seeing the results achieved by the Vatican Museums, it can be concluded that the implementation of museum accessibility practices addressed to BPS people is an achievable goal, though liable to continuous updating. In the context of accessibility to a BPS public it is also helpful to offer various options and approaches to meet their methods of learning and information acquisition.

As a result of this analysis, it is hereby proposed that research focusing on museum education for BPS people -as well as on museum accessibility- should therefore be conducted in the field, in so-called "ecologically valid" settings. This may include research using neurophysiological and psychological tools and methodologies aimed at understanding the unique perception of BPS visitors. Therefore the suggestion is that the museum must play the role of a laboratory, be open to research and be attentive to the latest studies on accessibility. The hope is that, by adhering to these recommendations, a wider range of museums will be more and more accessible to the BPS community in the future.

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