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META-MUSEUM UNPACKED #04

Confidence, Empathy, Resilience through Cultural Heritage



The **META-MUSEUM project** is a major research initiative, funded by the European Union's Horizon Europe programme, dedicated to *transforming* how we connect with cultural heritage. Moving beyond the traditional view of museums, the project explores how active engaging with cultural heritage can equip citizens with essential tools for modern life: confidence, resilience, and empathy. META-MUSEUM employs a **multi-disciplinary expertise**, and works to provide evidence-based ways for cultural experiences to address current societal challenges, making heritage not just something to observe, but a powerful, dynamic force for personal and community well-being.

To share these discoveries and behind-the-scenes insights with everyone and to bridge the gap between academic research and broad public understanding, the META-MUSEUM publishes META-MUSEUM UNPACKED, an open-access short article series. Published every three months on the project website, *META-MUSEUM UNPACKED* offers an easy-to-read window into how cultural heritage is being redefined for a more confident and resilient future.

Enjoy it!

CAN WE MEASURE WHAT CULTURE DOES TO US?

Inside the META-MUSEUM lab, where brain, body and emotions meet cultural heritage

Think of the last time something in a museum caught your attention. Perhaps it was an ancient object, a photograph, or a story that suddenly made the past feel surprisingly close.

You may remember what you thought or how it made you feel. But while you were looking, other things were happening too. Your brain was processing the experience. Your level of physiological arousal may have changed. Without noticing it, you may even have shifted your posture slightly forward or backward.

These small responses are usually invisible. But what if we could measure them?

This is one of the questions researchers at Vrije Universiteit Amsterdam have been exploring within META-MUSEUM. The aim is not to find a single “emotion detector”, but to look at a cultural experience from several perspectives at once: **what people say they feel, what happens in their brain, how their physiological state changes, and even how their body moves.**

Bringing the museum into the laboratory

Museums are fascinating places to study people, but they are also complex environments. Visitors walk around, talk to each other, look at different objects and follow different paths. To understand some of the mechanisms behind cultural experiences, the VU team therefore started somewhere simpler: by bringing a small part of the museum experience into a controlled laboratory setting.

AI-generated illustration of the experimental setup used to investigate responses to cultural heritage at Vrije Universiteit Amsterdam.

Fifty-one volunteers took part in the study, representing 23 different countries. Standing in front of a large screen, participants viewed a series of images while several aspects of their responses were measured simultaneously.





AI-GENERATED ILLUSTRATION OF THE EXPERIMENTAL SETUP USED TO INVESTIGATE RESPONSES TO CULTURAL HERITAGE AT VRIJE UNIVERSITEIT AMSTERDAM.

An EEG headset recorded electrical activity from the brain. A wearable sensor measured skin conductance, which changes with physiological arousal. At the same time, participants stood on a sensitive force plate capable of detecting tiny shifts in posture.

Why measure posture?

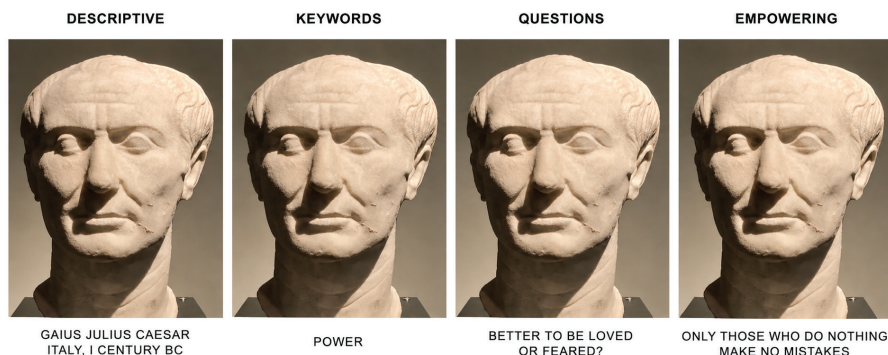
Because emotions do not only happen in our heads. When something attracts our attention, surprises us or makes us uncomfortable, our bodies may respond too. We may subtly lean towards or away from something, or momentarily reduce

our normal body sway. These movements are tiny and usually happen without us being aware of them, but they can be measured. And there was one more essential source of information: the participants themselves. Throughout the experiment, they reported aspects of their experience, such as how pleasant, arousing or informative they found what they had seen and how much confidence, awe or empathy they experienced.

Together, these measurements allowed the researchers to look at the same cultural encounter through different windows.



Three experiments, three questions



SAME IMAGE, DIFFERENT WORDS: PARTICIPANTS VIEWED CULTURAL HERITAGE IMAGES ACCOMPANIED BY DESCRIPTIVE INFORMATION, KEYWORDS, REFLECTIVE QUESTIONS, OR EMPOWERING STATEMENTS.

Rather than testing one single type of cultural experience, the researchers designed three experiments, each asking a different question.

The first was deliberately simple: **can the experimental setup capture different emotional responses?**

Participants viewed validated images designed to evoke happiness, surprise, sadness or disgust. This provided a controlled starting point before moving on to the much more complex world of cultural heritage.

The second experiment asked a question that goes directly to the heart of museum design: **can a few words change the way we experience the same image?**

Working with META-MUSEUM partners at Politecnico di Torino, researchers

showed exactly the same cultural heritage images accompanied by four different styles of text. Some had conventional factual descriptions, similar to the labels commonly found in museums. Others were accompanied only by keywords. A third group used questions inviting visitors to reflect personally on what they were seeing. Finally, some captions used empowering phrases intended to encourage confidence and a sense of agency.

Only the words changed. The images remained the same.

The third experiment moved from words to another rapidly changing aspect of visual culture: authenticity in the age of artificial intelligence.





PAST AND PRESENT, REAL AND AI-GENERATED: PARTICIPANTS VIEWED HISTORICAL AND CONTEMPORARY PROTEST IMAGERY ALONGSIDE AI-GENERATED REPRESENTATIONS OF BOTH.

Together with META-MUSEUM partners at the Friedrich-Schiller-Universität Jena, the team used the story of what is considered the first documented workers' protest in history, in ancient Egypt. Participants viewed historical material connected with the ancient event, images of contemporary protests, and AI-generated imagery representing both ancient and contemporary protests.

Importantly, participants knew when an image had been generated by AI. The question was not whether they could be "fooled", but whether knowing the origin of an image changed their experience of it.

So, what did we find?

Some of the clearest findings came from something deceptively simple: asking people what they experienced.

In the first experiment, happiness stood out clearly. When participants were asked which category they would prefer to see more of, 39 out of 50 selected the happy images. None

selected disgust. The happy images were also associated with the highest reported confidence.

But perhaps more interesting for museums was what happened when the images stayed the same and **only the captions changed**.

The empowering captions did what they were designed to do: participants reported feeling more confident after viewing them than after the other caption styles. Traditional descriptive captions, meanwhile, were considered the most informative. The EEG measurements also revealed differences between some forms of text: factual descriptions were associated with greater cognitive effort than simple keywords. Some differences also emerged in participants' subtle postural behaviour.

In other words, the small piece of text beside an exhibit is not necessarily a neutral addition. Changing the words can change the experience, **even when the cultural object itself remains exactly the same**.

The protest experiment produced another striking result. When participants were asked which images they would like to continue viewing, historical and contemporary real-world material dominated their choices: 23 participants selected the historical images and 22 the contemporary photographs. Only four selected the contemporary AI-generated images, and **not a single participant selected the historical AI-generated images.**

Real and AI-generated images also differed in how participants rated qualities such as pleasantness, arousal, awe, informativeness and empathy.

For museums increasingly considering the use of generative AI to reconstruct or illustrate the past, this raises an intriguing question. AI can create an image of an event for which no photograph could ever exist, but does that automatically help us connect with that event?

Our results suggest that the answer may be more complicated.

When the brain, body and experience tell different stories

One of the most important lessons from the experiment is also one of the least spectacular: there is no single signal that tells us how someone is experiencing culture.

Participants' own reports showed clear differences between many of the experimental conditions. The physiological, brain and postural measurements told a subtler story.

Some differences were detectable. Emotional images, for example, affected skin conductance, while different caption styles produced differences in cognitive effort and aspects of postural behaviour. Other measurements did not clearly distinguish between conditions.

This is precisely why combining different measurements matters.

What someone consciously reports, how physiologically aroused they become, what their brain is doing and how their body responds are related aspects of an experience, but they are **not interchangeable**. Each offers a different piece of information.

And cultural experiences are complex. A visitor can find something informative without finding it moving. Something can attract attention without being pleasant. An image can evoke empathy without increasing confidence.

Understanding those different dimensions is more useful than trying to reduce the museum experience to a single measure of "engagement".



From the laboratory back to the museum

The ultimate goal is, of course, not a future in which every museum visitor wears an EEG headset and stands on a force plate.

The laboratory gives us something different: a controlled environment in which we can change one element of an experience and ask what happens. Change the words beside an image. Change the way a historical story is visually represented. Compare authentic and AI-generated material. Then examine the experience from several perspectives. These experiments can help identify which elements deserve closer attention when cultural experiences are designed and tested in real-world settings.

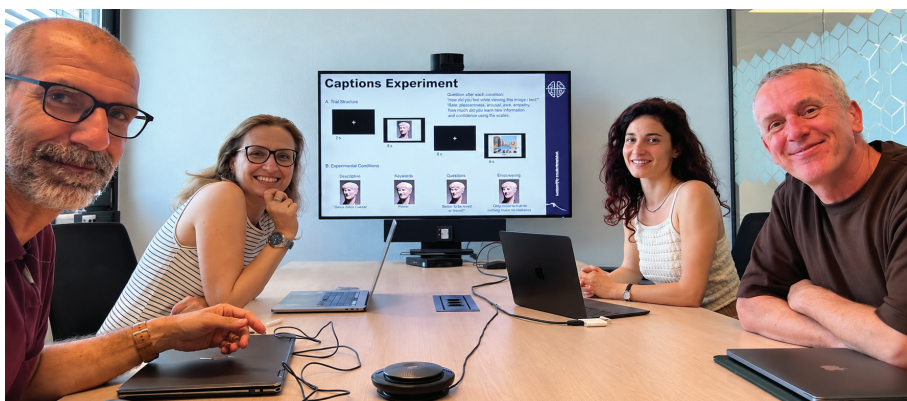
For museum professionals, that may mean thinking differently about elements that can easily be overlooked. A caption is not simply a container for information. The way a story is framed can influence how visitors relate to

it. And new technologies that can generate spectacular representations of the past do not necessarily create stronger emotional connections simply because they are visually compelling.

This fits into the broader ambition of META-MUSEUM: to move beyond asking only **“What did the visitor learn?”** and also ask **“What did this encounter make the visitor think, feel and experience?”**

Because cultural heritage is not experienced only with our eyes. We bring our memories, expectations and values with us. We interpret the words surrounding what we see. Our brains respond. Our physiological state changes. Even our bodies may move.

And by looking carefully at all those pieces together, we may begin to understand a little better **what culture actually does to us.**



BEHIND THE RESEARCH: NADIA DOMINICI, KALLIOPI IOUMPA AND JOHN STINS FROM THE VU META-MUSEUM TEAM DISCUSSING THE EXPERIMENTAL FINDINGS WITH PROJECT PARTNER MARCO IOSA (SAPIENZA UNIVERSITY OF ROME).



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GA 101132488 | HORIZON-CL2-2023-HERITAGE-01-04



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