

Report of the Study Project: Embodied Cognition on Wikipedia (Part I and II)

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This report was written by John Jairo Madrid Carvajal, Institute of Cognitive Science, Osnabrück University. The report documents the individual work done by the author. However, the study project's final version results from a joint effort with other project members. Electronic mail may be sent to jmadridcarva@uos.de

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Abstract

Wikipedia is a widely and commonly used online free-content encyclopedia. However, the quality and reliability of Wikipedia's articles and content vary significantly. Since articles are written collaboratively by largely anonymous volunteers worldwide, they may contain false, incomplete, and debatable information. This report documents the joint effort to write, update and improve the quality of the "embodied cognition" article on Wikipedia—and related ones. Over time, this resulted in an upward trend to reach encyclopedic quality with a "good article" score on the WikiProject Psychology's rating scale.

keywords: Wikipedia, embodied cognition, cognitive (neuro)science, free-content, online encyclopedia

Introduction

Over the past years, with the Internet's advent, scholars have progressively moved toward online-based resources when doing research. Journals, magazines, and newspapers now offer online content for everyone to access and document their research. However, the reliable scientific content accessible often costs and, in many cases, subscriptions become unaffordable for many students, academics, and people worldwide. Additionally, standard journals' format lacks dynamism; they often offer readers a limited number of single papers. In contrast, the Wikipedia project first launched around 2001, planned to produce free content online to facilitate equal access to information for everyone. Wikipedia's encyclopedic articles comprise information on a particular topic based on multiple documents and resources, providing a better overview of the subject matter.

Wikipedia has become a widely and commonly used online free-content encyclopedia. Wikipedia's content has exponentially grown since it was launched, becoming "the largest and most-read reference work in history" (See Figure 1). In 2007, it even became one of the ten most popular websites overpassing *The New York Times* and *Apple* (Wikipedia, 2022), and its exponential growth was shown to be driven by "its rapidly increasing user base, highlighting the importance of its open-access editorial policy" (Almeida et al., 2007). However, due to its collaborative nature, Wikipedia's articles are highly susceptible to misinformation, incompleteness, and even vandalism. Anyone with an internet connection and an anonymous nickname (or none) can create, edit, and manipulate Wikipedia's content. Thus, both the quality and reliability of Wikipedia's articles vary significantly from one another and the same article over time.

One such low-quality and unreliability Wikipedia entry is the "embodied cognition" article. Embodied cognition is an interdisciplinary research field with an unclear past and a relatively short history (McCarthy, 2016; R. A. Wilson & Clark, 2005). It has recently gained popularity among researchers who seek to understand and explain how the (human) mind and its underlying cognitive processes work. More

specifically, embodied cognition is a theory of mind that emphasizes the body's significant role during the acquisition, development, and employment of cognitive capabilities (Calvo & Gomila, 2008). More radicalized versions of the embodied cognition theory go even further and hold that cognition is (entirely) determined by external sources outside the body such as the natural and social environment (Chemero, 2011; Clark, 1999; A. D. Wilson & Golonka, 2013) and with no need for mental representations (Sanches de Oliveira et al., 2021).

As an interdisciplinary theory of cognition, embodied cognition reaches readers and scholars across multiple disciplines such as cognitive science, psychology, neuroscience, artificial intelligence, linguists, and philosophy—to name a few. Indeed, evidence supporting the embodied cognition theory comes from insights and findings drawn from within those disciplines (Lakoff, 2012). Likewise, embodied cognitive perspectives have been proved useful when incorporated into specific fields. An embodied perspective of robotics, for instance, allowed researchers to move from a mere representation and information processing approach to artificial intelligence (AI) to a more embodied AI, giving birth to situated robotics (Brooks, 1991). Similar examples of the benefits of the embodiment theory can be found across many other scientific fields, which eventually end up providing evidence in favor of the embodied cognition theory.

Despite both the gained popularity of the embodied cognition theory across different research fields and the relevance of Wikipedia as a widely used source of information, little is done to improve the quality of the embodied cognition article's content on Wikipedia. When we deepen into the embodied cognition article's revision history on Wikipedia (See Figure 2), only one major attempt to improve its content took place over a period of eighteen years. Indeed, the embodied cognition article was initially created in 2002 and remained without significant edits to improve it until 2011. During that year, 33 editors—*Wikipedians* as (Panciera et al., 2009)—did 203 edits, most of which were significant edits (major = 175), and the article reached a size of about 54000 characters. Afterward, no major or significant edits were made to the article between 2011 and the end of 2021. In 2015, for instance, only seven Wikipedia

editors did a total of 99 edits, most of which were minor edits (minor = 59), and the article reached a size of about 71000 characters. In the following years, the article and its size remained mostly invariant (See Table 1 for more detailed information on the edits count and article's size per year).

From the fact that only one major edit to the embodied cognition article had been done in almost twenty years of its history, we can deduce that: 1) although the article may contain substantial information on the topic, it may be outdated; 2) fewer people are contributing to the article's content; 3) the article fails to cope with Wikipedia's current standards and Manual of Style (MoS). Therefore, given the relevance of the embodied cognition theory across multiple disciplines and the role of Wikipedia as a source of information that many people use worldwide, this project contends that improving the content of the embodied cognition article on Wikipedia is critical.

In the spirit of the Wikipedia online free-content policy, in this project, we undertook a collaborative effort to write, update, and improve the quality of the content and visualization of the "embodied cognition" article on Wikipedia. Similarly, other Wikipedia articles akin to embodied cognition were edited to expand or improve their content (when necessary and viable). The primary objective was to achieve an updated, more encompassing, and well-written overview of the thesis, history, scope, and applications of embodied cognition. Besides, the revised version also includes a section on the controversy surrounding the embodied theory of cognition and its current challenges. Several modifications achieved this undertaking. Initially, a preliminary revision of the current state of the embodied cognition article on Wikipedia (as of February 2021) was done to identify sections, topics, and impoverished information that required editing. Afterward, a literature review on the subject matter was performed, and a written summary of it (together with the references) was then uploaded to Wikipedia through the "editing" section (via either visual or source editing). Additionally, for pedagogical purposes, several images and an Infobox were created and added to the respective section where they belonged. Finally, a rigorous edit of the

references together with a cross-referencing ("Wikilinks") of the embodied cognition article in other Wikipedia articles was done. This process ensured that the article complied with Wikipedia's MoS and that it would become more visible to readers of other topics akin to embodied cognition.

Methods

Due to the project's nature, various methodologies were used to keep track of the current and future tasks, the status of the edits, and the overall progress and outcomes of the project. Methods include, among others, group meetings, literature reviews, image designs, actual editing on Wikipedia, and data analysis. Similarly, in this one-year-long study project, members were free to choose the topics and specific tasks they wanted to undertake. These tasks were specified in an online shared co-working space such as a Trello board, a Miro board, or a Google document (See Figures 3, 4, and 5). Consequently, each member would use different tools to finalize a particular self-assigned task.

Group Meetings

During the study project, two kinds of meetings took place. Principal biweekly meetings with the project's supervisor required members' active participation and spontaneous meetings (the week in between) where anyone freely joined and discussed what they had worked on and the status of their current task. During the principal meeting, members discussed possible editing ideas, progress made, and edits already uploaded on Wikipedia. For every session, a group member took the lead as a moderator and announced the main topics to be reviewed. Besides, the moderator's responsibility included writing a protocol containing a summary of the key ideas discussed and uploading it to the Trello board for all members to have it available in case they were absent from the meeting.

Communication

Due to the COVID-19 pandemic, meetings were held online via Zoom video conferencing, and a telegram group was created to facilitate interaction and communication between the group members.

Protocols

The protocol's format was open, and the moderator decided how to write it. The date of the meeting, the members' assistance, and the meeting's agenda were included at the start of the protocol, followed by a detailed summary of every member's intervention. Protocols were not longer than one or two pages (unless necessary). A total of nine protocols were written during the project, four of which were written by the author of this report—protocols number 5, 7, 8, and 9 (See Appendix A). In the final stages of the study project, protocols were considered unnecessary because communication between group members was more fluid, and each member knew what tasks the others were doing.

Literature Review

One essential step in improving the *embodied cognition* article on Wikipedia concerns the literature review. Initially, sections of the existing article that needed to be expanded, rewritten, and/or removed were identified. Afterward, the articles referenced in those sections were read to ensure that the main ideas and results were adequately conveyed to avoid misleading information or copyright violations.

After the article had undergone (minor) changes and editors had familiarized themselves with the content, new entire sections were written (e.g., *The theory of embodiment* and *The history of embodied cognition*). When adding new content sections, the articles, books, or book chapters were chosen based on their relevance to the topic. Relevance was evaluated by scrutinizing, for instance, the number of citations an article had. For this, sources such as *Altmetric* (a bookmarklet tool for researchers), *Connected Papers* (a tool for mapping papers and their connections), and *Zotero* (a tool

to collect, organize, annotate, and cite articles) were used. Appendix B contains an exemplary list of literature material reviewed by the author of this report.

Data Analysis

Wikipedia articles include a statistics section where information on the edits count, the article's size, and the contributions of each editor are displayed. Additionally, it is possible to see the views the *embodied cognition* page on Wikipedia has had over the years. Both datasets (i.e., edits count and page views) were downloaded and analyzed. One main goal was to identify and quantify the article's changes. Through the descriptive statistics, several changes were identified, such as the number of total edits performed during this project, the variation in the article's size, and the total number of views the embodied cognition page had during the duration of the project was compared to the views it had in the months before the project.

Data Collection

The datasets were collected from Wikipedia's statistics Xtools page¹ and Pageviews website² which provides datasets and comparisons of pageviews across multiple pages.

Tools

The tools used to develop the different edits varied from member to member. The ones reported here helped the author of this report to write, create, edit, and keep track of every single modification. They include, among others, *Miro*, *Trello*, *Zotero*, *Microsoft Word*, *Keynote*, *Sketch Engine*, *Connected Papers*, *Altmetric*, and *PyCharm*.

¹ The statistics Xtools dataset is available at

https://xtools.wmflabs.org/articleinfo/en.wikipedia.org/Embodied_cognition

² The Pageviews is available at

https://pageviews.wmcloud.org/?project=en.wikipedia.org&platform=all-access&agent=user&redirects=0&range=latest-20&pages=Embodied_cognition

Results

The editing actions performed throughout the project materialize in a well-informed and well-written encyclopedic article that provides Wikipedia readers a comprehensive overview of the embodied cognition theory. The article's current state encompasses many notable topics in the field, which are covered in detail with the corresponding references and visualizations (whenever possible). More specifically, 1) the article contains substantial and updated information on the topic; 2) people who contributed to the article's content are knowledgeable about it and/or familiar with Wikipedia editing guidelines; 3) the article copes with Wikipedia's current standards and MoS.

The project was completed over a little more than one year (around 15 months), where the author of this report spent a total number of hours that surpasses the initially specified number of hours (approx. 300h).

The results are divided into two parts. The first part shows the contributions made by the author of this report to the article's editing process and the content visualization. The second part investigates the impact of the edits on the quantitative and qualitative aspects of the Wikipedia page.

Part 1: Article Editing and Content Visualization

The editorial process involved content and structural edits. All contributions to improving the article were made through direct edits on Wikipedia, whose interface offers both source and visual editing. There were several types of edits (e.g., minor, major, and reference editing), and a combination of them was used during the entire duration of this project. Minor edits are comprised of typos, misspellings, and small changes that editors considered discussing them was unessential. On the contrary, major edits could raise disputes, and discussion was required before uploading on Wikipedia. All the improvements and contributions were made following Wikipedia's

Manual of Style (MoS)³.

For better communication with other (possible) Wikipedia editors external to the project, major structural and new content edits were announced through hidden comments inside the article and/or in its "*Talk*" section. Editors were encouraged to join the discussion and provide their thoughts on the topic.

Content

Two new sections were written to address the *Theory* and *History* of embodied cognition (See Appendix C). The contents of these sections were discussed during group meetings and after approval, edits were uploaded on Wikipedia. When submitting an edit, a short comment was made explaining what was done and in what section of the article. Wikipedia automatically recognizes if the edit was an addition (green +) or deletion (red -) of content.

Additional content amendments involved writing and improving paragraphs in individual sections such as *the scope of embodied cognition*, *the approach and avoidance task*, and *perception*, among others. A considerable number of edits (total = 172, major = 151, minor = 21) were done by the author of this report to the different sections of the article (See Appendix D for a partial list of the individual edits done).

Structure

Table of Content (TOC). As the number of contributions increased, so did the complexity of the TOC. New headers and sub-headers for each section were discussed and updated on Wikipedia. The article's TOC underwent several progressive changes until it reached an accepted encyclopedic style, as suggested by Wikipedia's MoS. Before any actual changes, a proposal was discussed, announced to editors via hidden comments, and made public in the "*Talk*" section (See Appendix E for details). The proposal compares old versus new headers and sub-headers for the article's TOC. During the project, the new TOC was updated based on this dynamic. However, during

³ As suggested in *Wikipedia's Manual of Style (MoS)*

https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style

the peer-review process to obtain GA (+) status, the reviewer suggested that shorter, more encyclopedic names were necessary to comply with Wikipedia's MoS. Thus, the TOC was updated accordingly (See Appendix E for the final version of the TOC).

References Editing. Upon agreement, references were updated to follow APA style. This process implied updating how articles and content material were cited throughout the article and how they would appear in the section containing the list of references. Each individual reference was edited to meet this criterion.

Cross-referencing. To improve the article's readability and readers' understanding of the topic, Wikipedia suggests doing cross-referencing. For this project, Wikilinks were used for this purpose⁴. Inside the *embodied cognition* article, external Wikipedia pages were linked and vice versa. To increase the visibility of the article, Wikipedia pages with topics akin to embodied cognition were targeted (e.g., *Mind*, *Psychology*, *Cognitive Science*, *Cognition*, etc.). If the embodied cognition theory was mentioned, a wikilink was placed inside those Wikipedia pages to direct readers to the embodied cognition page. When the mention was missing, a sentence or a paragraph was written with the corresponding wikilink.

New Images Creation

To further improve the embodied cognition article (and any other article) on Wikipedia, images are recommended for any article to get a better status on Wikipedia's quality scale. Indeed, images are considered an illustrative aid to understanding. Several new images were created to avoid infringing intellectual property rules and comply with Wikipedia's copyright requirements. According to Wikipedia MoS/Images, images must be meaningful and relevant to the topic's content, not simply decorative. Thus, the ideas for each image created were proposed and discussed during the group meeting. After approval, each image was uploaded and placed inside the respective section of the Wikipedia article.

⁴ For a definition of Wikilinks and a description of how to use them refer to https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style/Linking

A great effort was made to produce a good collection of images depicting different aspects of the embodied cognition theory since images for this rather complex topic are rare or non-existing. A total of six images were created by the author of this report; one was left incomplete due to time and workload constraints (See Complementary Figure A in Appendix F).

History Timeline. Initially, research was done to find a suitable structure for the history section content and an appropriate orientation (vertical vs. horizontal). Besides, Wikipedia's preferred image format and size were also considered. Several potential options were presented to the group in an initial draft, and one was chosen. Some structures considered for this image included a *fishbone*, a simple *tree-like diagram*, a *Sankey diagram*, and a *mind map*. Similarly, different software (CSS, JavaScript) and applications (Keynote, PowerPoint, Miro) were explored for the making of the image (See Complementary Figures B and C in Appendix F for the alternative versions proposed). The result was a vertically elongated image created using the Miro board. The image contains detailed information on the history and timeline of the embodied cognition theory (See Figure 6). After approval, the image was uploaded inside the *History* section with its respective description/caption.

The Scope of Embodied Cognition. To show how the multiple disciplines and aspects of embodied cognition are intertwined, a Venn diagram was designed. A partial sketch was initially drawn using Keynotes, and the final version was an interactive figure on HTML created using amCharts 4. The image was saved in PNG format to upload it on Wikipedia(See Figure 7)

Approach and Avoidance Task (AAT). A visit to the Institute of Cognitive Science eye-tracking lab at Osnabrueck's University was scheduled with the lab manager, who willingly offered to perform the AAT while pictures were taken. An iPhone 11 Pro Max camera was used for taking the photos. Afterward, the images were selected, cropped, and arranged accordingly using Keynote to create an illustrative experimental design setting for the AAT. The final product consists of an image in GIF format showing the respective hand movements on both the response pad and the

joystick (See Figure 8).

Change Blindness. Initially, a GIF image was created using Keynote; and uploaded on Wikipedia to illustrate the change blindness effect (See Complementary Figure F1 in Appendix F). However, during the peer-review process to obtain *Good Article* quality status, the editor suggested using a different set of images to make it easier for Wikipedia readers to see the desired effect. Thus, a different collection of photographs was used to create a new version, and the new GIF was updated on Wikipedia (See Figure 9).

Theory Infobox. *Info-boxes* are essential to Wikipedia pages as they contain summarized information on a particular topic. Since Wikipedia lacked an info-box on "*Theories*", a template was created for the *embodied cognition* theory directly on Wikipedia through a common code format of a parameter/name and an attribute/value associated with it. The template can be used and modified for other Wikipedia pages about theories.

Afterward, the info-box was called into the embodied cognition article by enclosing its name (i.e., Theory), the corresponding parameter/name, and attribute/value pairs within a double set of braces (See Figure 10).

Reuse from Wikimedia Commons

Although not self-created, seven additional images were searched for and added to the article. These images were obtained using Wikimedia Commons, a repository of open images (and media in general) previously uploaded by other users and are available to be reused. The search, although not straightforward, was done by looking into the categories provided by Wikipedia. A category is, for instance, "psychology". These images include: *Human (male)*, *Classical Cartesian Model*, *Dynamic Embodied Model*, *Atlas the Robot connecting a Hose to a Pipe*, *Atlas the Robot climbing into a Vehicle*, and *The Phantom Limb Illusion* (See Complementary Figure F2 in Appendix F).

Wikipedia's MoS/Images was followed when uploading the images. Specific criteria were considered, such as preferred image size, format, quality, naming convention, and location.

Part 2: Quantitative and Qualitative Measurements

To understand the impact of the editing contributions done in this project to the embodied cognition article on Wikipedia, four additional aspects were analyzed and compared to the state of the article previous to the beginning of this project. These aspects comprise quantitative and qualitative measurements of the article and are considered from a group and an individual contributor level.

Article's Size

At a group contribution level, the total edits of the project led to an increase in the article's size. As shown in Figure 2 (red line), from 2015 until the beginning of this project (beginning of 2021), the embodied cognition article's size (in characters) remained almost invariant, with about 75,000 characters. In 2021, the article had reached a character count of about 140,000 characters, and by the end of this project in May 2022, it had more than doubled against its original size to over 166,000 characters.

At the individual level, the author of this report appears as the primary contributor and, thus, as the article's "*author*" number one. As shown in Figure 11, a total of 56,274 characters make up a contribution of 37.2%, more than three times the second most contributing author. All project team members together (the first 7 in the list) contributed over 80% to the current character count of the article.

Article's Views

An additional quantitative measurement for calculating the impact of the editing contributions on the article concerns the pageviews. As shown in Figure 12, the daily average pageviews increased during the 15 months period of this project compared to the prior 15 months period. The daily average views' estimated tendency per month is around 340 views previous to the project and almost 400 during the project (See Figure 13). This total increase calculates to a 14,8% increase in the total pageviews (or article visits) as found and shown in the summary statistics of both periods (See Table 2 for the descriptive statistics).

Article's Quality and Importance Scale

The main impact of the entire editing process can be seen in the article's quality and importance scale, which were progressively improved and updated throughout the project. The embodied cognition article belongs to the philosophy/mind and psychology Wikiprojects and had an initial (*C*) class in the quality scale of both. Thus, it was missing content and reliable sources, containing irrelevant material, leaving the reader with an incomplete review of the embodied cognition theory. On the importance scale, it was rated *Low-importance* for the philosophy/mind Wikiproject and *Unknown* for psychology.

During the editing process, the importance and quality scale were updated by someone external to the project. It was granted (*B*) *class* in the quality scale and assigned a *Mid-importance* for the psychology Wikiproject. By then, the article was described as mostly complete but requiring further work to satisfy a serious student or researcher. After a peer-reviewing process with an impartial and knowledgeable Wikipedia editor, the article was granted the *Good Article (GA)* status.⁵ The article is described as useful to the reader and near to professional encyclopedic quality.

As the percentage and the cumulative percentage in Figure 14 show, with this new (*GA*) quality rating, the embodied cognition article made it to the top 1% of the *Mid-importance* rated articles of the psychology wikiproject and to the top 1% of the *Low-importance* ranked articles in the philosophy/mind wikiproject. Furthermore, the article also made it to the top 1% of the total articles of both Wikiprojects (See Tables 3 and 4 and Complementary Figure F3 in Appendix F for the total cumulative percentage).

⁵ The peer-reviewing process was entirely done by the author of this report since the Wikipedia editor answered the peer-request for *GA* only after the project had been concluded and participation on this process was only voluntary and in no way compulsory.

Article's Conference Acceptance

This project concludes with an abstract's acceptance to be presented at the *10th Budapest Visual Learning Conference* to take place on Nov. 17, 2022 (See Appendix G)⁶. The conference is organized by the Committee for Communication and Media Theory of the Hungarian Academy of Sciences and Corvinus University of Budapest. The abstract entitled *Embodied Cognition on Wikipedia: Making Open-Access Quality Research Available Online* summarizes this project's main objectives and findings, as well as the central topics concerning embodied cognition. Furthermore, the article describes the significance of engaging in editorial practices to make good-quality articles available online.

Discussion

This project has discussed the potentialities and significance of the embodied cognition theory for current research on the nature and underlying physical mechanisms of cognition. At the same time, it has highlighted the role of Wikipedia in research as a free-content source of information used by many scholars worldwide. More specifically, we have discussed Wikipedia's "embodied cognition" article's susceptibility to misinformation and incompleteness and the need for researchers, experts, and educators to enroll in collaborative efforts to improve its content. In this spirit, this project has explored and developed editing practices and methodologies that can become meaningful for coordinating Wikipedia editors when contributing to Wikipedia. This project shows how collaborative editing led us to an updated, well-written, and illustrated entry on embodied cognition, a better qualification of the articles in the quality scale, and an increase in the size and page views of the article.

Based on the findings of this project, it is evident that these editing practices benefit many researchers and scholars worldwide by providing them with a general and well-written overview of the specific topic in question. It was also identified that while engaging in these editing practices, the pageviews can increase. The reasons and

⁶ The abstract is also available at <http://www.hunfi.hu/nyiri/FFF/papers/MC.pdf>

specifics of how collaborative editing practices affect page views remain an open question. Likely reasons for the article to reach more views can include, among others, the fact that the article meets Wikipedia's MoS and is more readable, it contains more illustrative images, it is larger in (characters) size, and it is cross-referenced in other Wikipedia entries akin to embodied cognition (via Wikilinks). Without these components, readers are likely to end with an incomplete picture of the topic, mistrust or dislike the page's content, or never find out about the article at all (unless the topic is known beforehand).

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Table 1

Embodied Cognition Edits and Size Count per Year

	Date	Time	Edits	Minor edits	Editors	Size
0	2002		8	2	6	492
1	2004		32	16	11	5566
2	2005		16	3	9	5782
3	2006		17	6	5	6699
4	2007		16	7	4	6896
5	2008		42	27	2	16678
6	2009		38	17	9	14475
7	2010		30	12	7	21183
8	2011		203	28	33	54061
9	2012		55	18	1	55732
10	2013		39	11	14	57889
11	2014		32	8	7	62237
12	2015		99	59	7	71509
13	2016		22	8	6	75652
14	2017		19	6	4	76022
15	2018		14	5	4	76624
16	2019		14	6	4	77759
17	2020		24	14	3	77549
18	2021		261	64	10	137795
19	2022		305	63	6	166875

Note. This table was produced using data provided by the Wikimedia Statistics xtools page. Wikipedia indicates that some data may be inaccurate due to how revisions were stored in the early days of MediaWiki. The data is available at

https://xtools.wmflabs.org/articleinfo/en.wikipedia.org/Embodied_cognition#year-counts

Table 2*Embodied Cognition Pageviews' Descriptive Statistics*

Embodied cognition								
	count	mean	std	min	25%	50%	75%	max
Time period								
Before	15.0	339.934203	31.029994	291.741935	327.233333	335.322581	367.177419	384.133333
During	15.0	390.382074	83.574523	291.870968	347.354839	376.800000	414.774194	636.633333
Change in %	0.0	0.148405	1.693346	0.000442	0.061490	0.123694	0.129629	0.657324

Note. A table containing the summary statistics of the pageviews for the 15 months period previous and during the project (count column). The change in percent indicates the mean change in page views (mean column). It is available in the GitHub repository of this project at

https://github.com/JohnMadrid/EC_env_images/tree/main/WikiPageAnalysis/Images

Table 3*Wikinote Project Psychology's Quality Scales with Percentages*

Quality		Top	High	Mid	Low	NA	???	Total	% by Total scales	% by Mid importance scale	% cumulative Mid	% cumulative Total
0	FA	0.0	4.0	5.0	9.0	0.0	0.0	18	0.118601	0.211864	0.211864	0.118601
1	FL	0.0	0.0	1.0	1.0	0.0	0.0	2	0.013178	0.042373	0.254237	0.131778
2	GA	3.0	13.0	25.0	57.0	0.0	0.0	98	0.645714	1.059322	1.313559	0.777492
3	B	19.0	150.0	263.0	217.0	0.0	0.0	649	4.276207	11.144068	12.457627	5.053700
4	C	21.0	317.0	1015.0	1486.0	0.0	33.0	2872	18.923371	43.008475	55.466102	23.977071
5	Start	9.0	189.0	878.0	2790.0	1.0	1636.0	5503	36.258813	37.203390	92.669492	60.235883
6	Stub	0.0	7.0	128.0	1301.0	0.0	1327.0	2763	18.205179	5.423729	98.093220	78.441062
7	List	6.0	11.0	45.0	88.0	0.0	0.0	150	0.988338	1.906780	100.000000	79.429400
8	Category	0.0	0.0	0.0	0.0	2164.0	0.0	2164	14.258417	0.000000	100.000000	93.687817
9	Disambig	0.0	0.0	0.0	0.0	21.0	0.0	21	0.138367	0.000000	100.000000	93.826184
10	File	0.0	0.0	0.0	0.0	13.0	0.0	13	0.085656	0.000000	100.000000	93.911840
11	Portal	0.0	0.0	0.0	0.0	11.0	0.0	11	0.072478	0.000000	100.000000	93.984318
12	Project	0.0	0.0	0.0	0.0	19.0	0.0	19	0.125189	0.000000	100.000000	94.109508
13	Template	0.0	0.0	0.0	0.0	166.0	0.0	166	1.093760	0.000000	100.000000	95.203268
14	0	0.0	0.0	0.0	0.0	589.0	0.0	589	3.880872	0.000000	100.000000	99.084140
15	Other	0.0	0.0	0.0	0.0	136.0	0.0	136	0.896093	0.000000	100.000000	99.980233
16	Unassessed	0.0	0.0	0.0	0.0	0.0	3.0	3	0.019767	0.000000	100.000000	100.000000

Note. This table was produced using data provided by Wikipedia's assessment page.

The data is available at

https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Psychology/Assessment#Importance_scale

Table 4*Wikinote Project Philosophy's Quality Scales with Percentages*

Quality		Top	High	Mid	Low	NA	???	Total	% by Total scales	% by Low importance scale	% cumulative Low	% cumulative Total
0	FA	0.0	8.0	17.0	17.0	0.0	0.0	42	0.177906	0.167587	0.565160	0.177906
1	FL	0.0	0.0	0.0	5.0	0.0	0.0	5	0.021179	0.049290	0.565160	0.199085
2	GA	6.0	31.0	53.0	90.0	0.0	2.0	182	0.770925	0.887224	2.327128	0.970010
3	B	40.0	193.0	313.0	506.0	0.0	65.0	1117	4.731447	4.988170	12.732713	5.701457
4	C	27.0	354.0	684.0	1437.0	0.0	343.0	2845	12.051000	14.166009	35.472074	17.752457
5	Start	20.0	366.0	1248.0	3868.0	2.0	1582.0	7086	30.015249	38.130915	76.961436	47.767706
6	Stub	0.0	74.0	599.0	4088.0	0.0	1188.0	5949	25.199085	40.299685	96.875000	72.966791
7	List	1.0	38.0	87.0	122.0	0.0	31.0	279	1.181803	1.202681	99.767287	74.148594
8	Category	0.0	0.0	6.0	2.0	4159.0	0.0	4167	17.650796	0.019716	99.966755	91.799390
9	Disambig	0.0	0.0	0.0	0.0	69.0	0.0	69	0.292274	0.000000	99.966755	92.091664
10	File	0.0	0.0	0.0	0.0	257.0	0.0	257	1.088614	0.000000	99.966755	93.180278
11	Portal	0.0	0.0	0.0	0.0	105.0	0.0	105	0.444764	0.000000	99.966755	93.625042
12	Project	0.0	0.0	0.0	0.0	192.0	0.0	192	0.813284	0.000000	99.966755	94.438326
13	Redirect	0.0	0.0	0.0	6.0	796.0	0.0	802	3.397154	0.059148	99.966755	97.835479
14	Template	0.0	1.0	1.0	1.0	338.0	0.0	341	1.444426	0.009858	100.000000	99.279905
15	Other	0.0	0.0	0.0	0.0	97.0	0.0	97	0.410878	0.000000	100.000000	99.690783
16	Unassessed	0.0	0.0	0.0	2.0	0.0	71.0	73	0.309217	0.019716	100.000000	100.000000

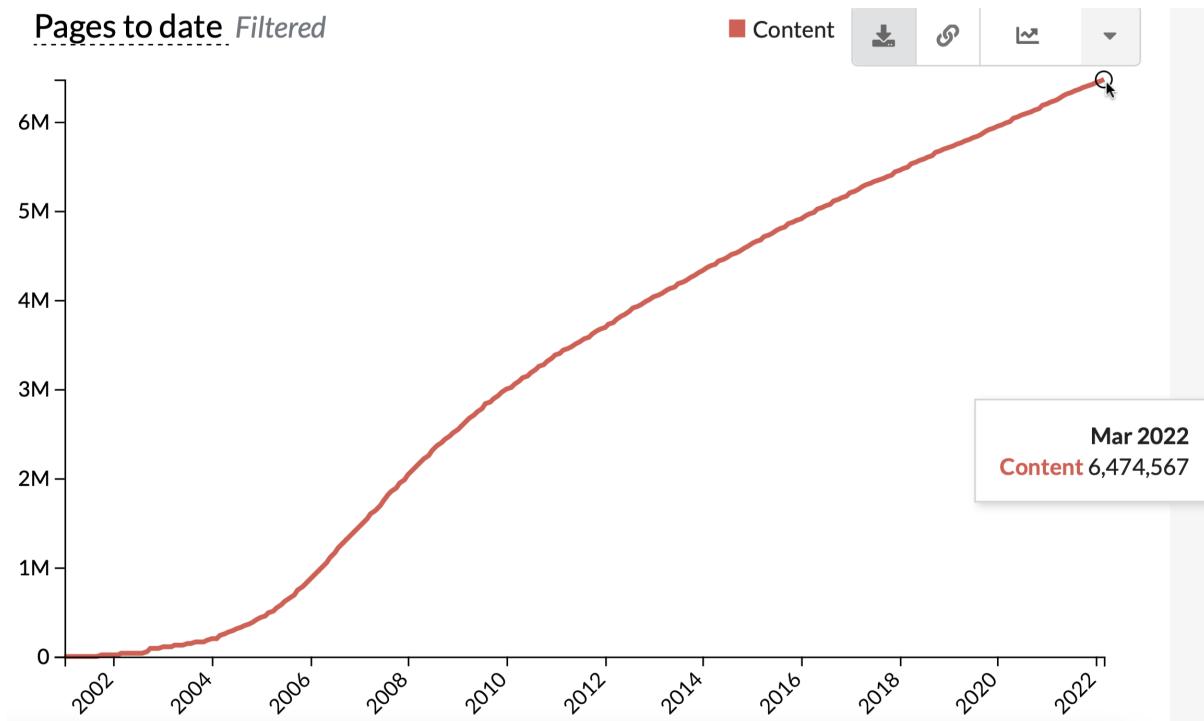
Note. This table was produced using data provided by Wikipedia's assessment page.

The data is available at

https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Philosophy/Assessment#Quality_scale

Figure 1

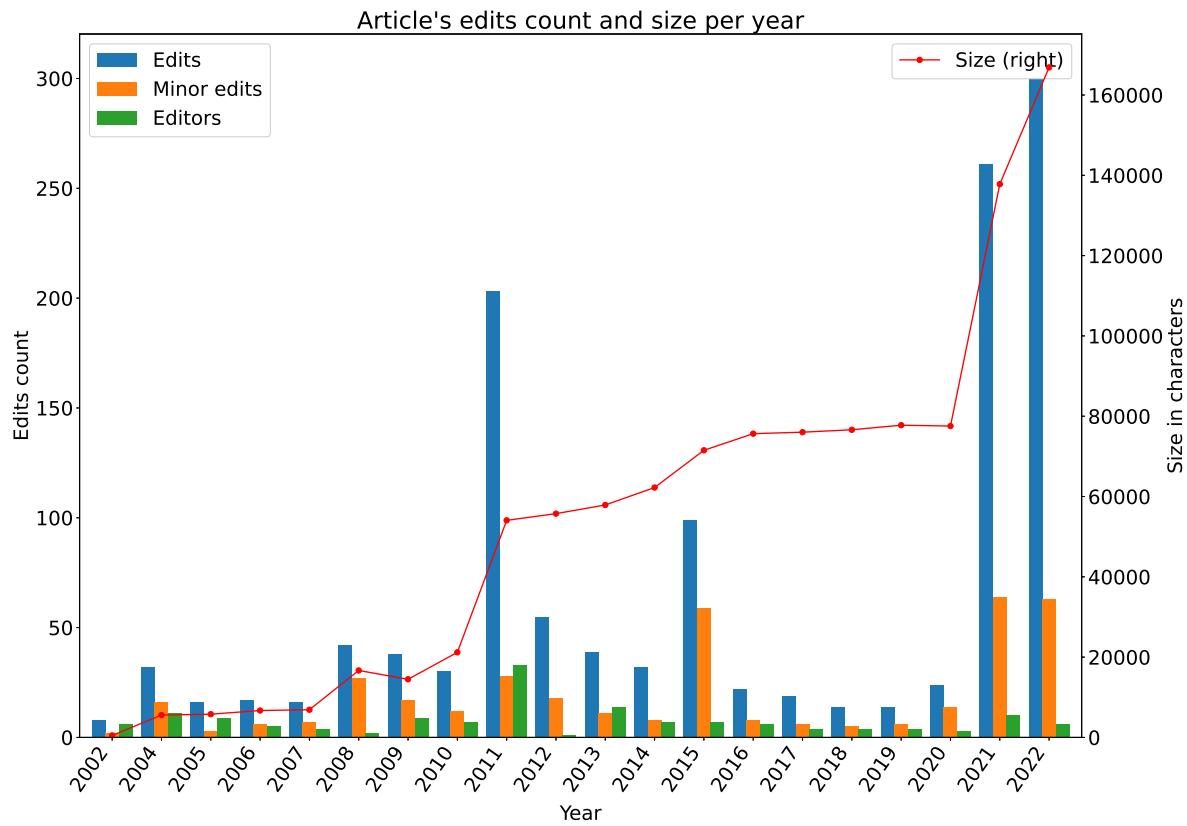
The Running Count of all Pages Created on Wikipedia.



Note. This image was produced using the Wikimedia Statistics page available at
https://stats.wikimedia.org//en.wikipedia.org/content/pages-to-date/normal|line|2001-01-01 2022-04-01|page_type content|monthly

Figure 2

Article's (total) Edits Count and Size in Characters per Year since its Creation



Note. The histogram indicates the total edits and editors count of the embodied cognition page on Wikipedia since its creation in 2002 (left y-axis). The red line plot indicates the article's size in characters per (end of) year (right y-axis). This image was produced using data provided by the Wikimedia Statistics xtools page. The data is prone to inaccuracies and is available at

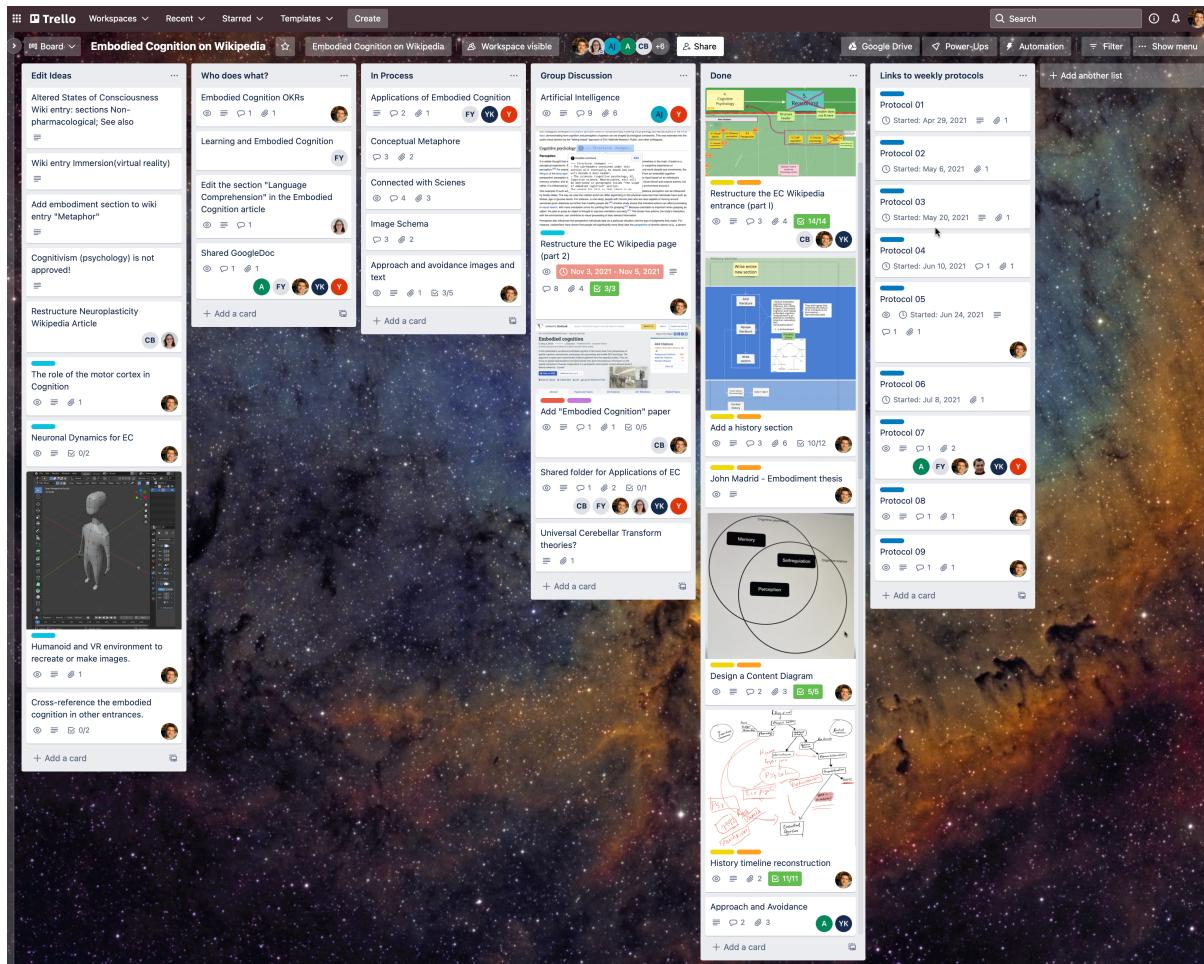
https://xtools.wmflabs.org/articleinfo/en.wikipedia.org/Embodied_cognitionyear_counts.

The corresponding python notebook is available on a GitHub repository at

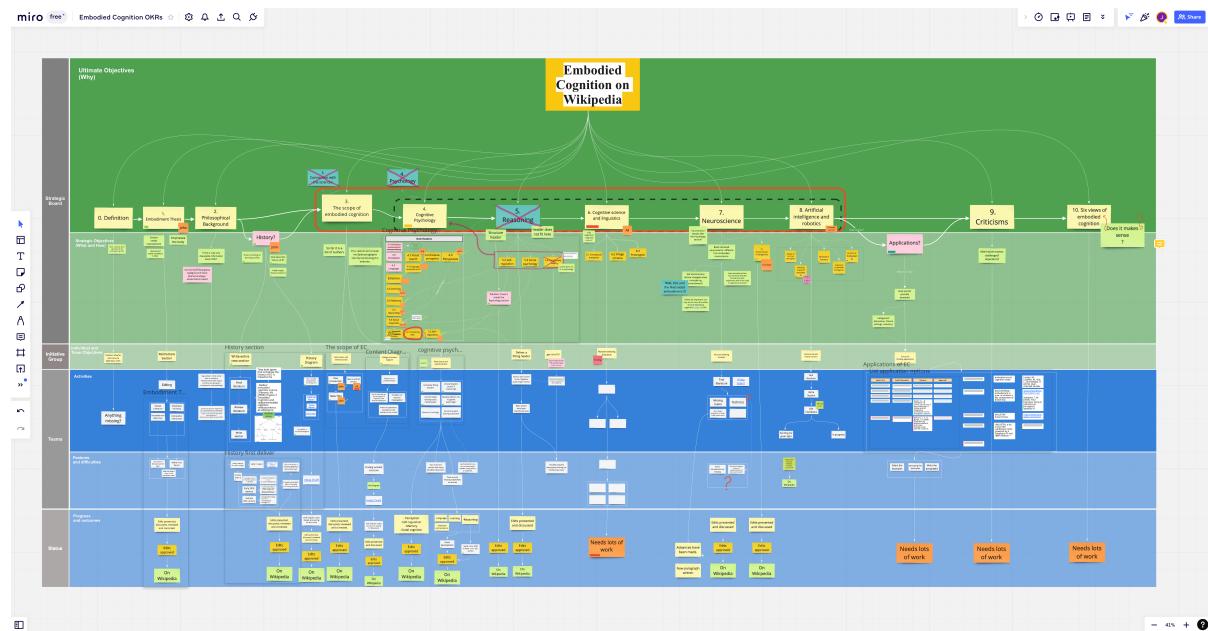
https://github.com/JohnMadrid/EC_env_images/tree/main/WikiPageAnalysis

Figure 3

Embodied Cognition's Trello Board



Note. Screenshot of the Trello board created to keep track of the project's new editing ideas. It may require access permissions, and it is available at <https://trello.com/b/dbJszd0V/embodied-cognition-on-wikipedia>

Figure 4*Embodied Cognition's OKR's Board on Miro*

Note. Screenshot of the objective and key results (OKRs) board created to keep track of the project's content and structural changes. It may require access permissions, and it is available at https://miro.com/app/board/o9J_l-fqCMM=/

Figure 5

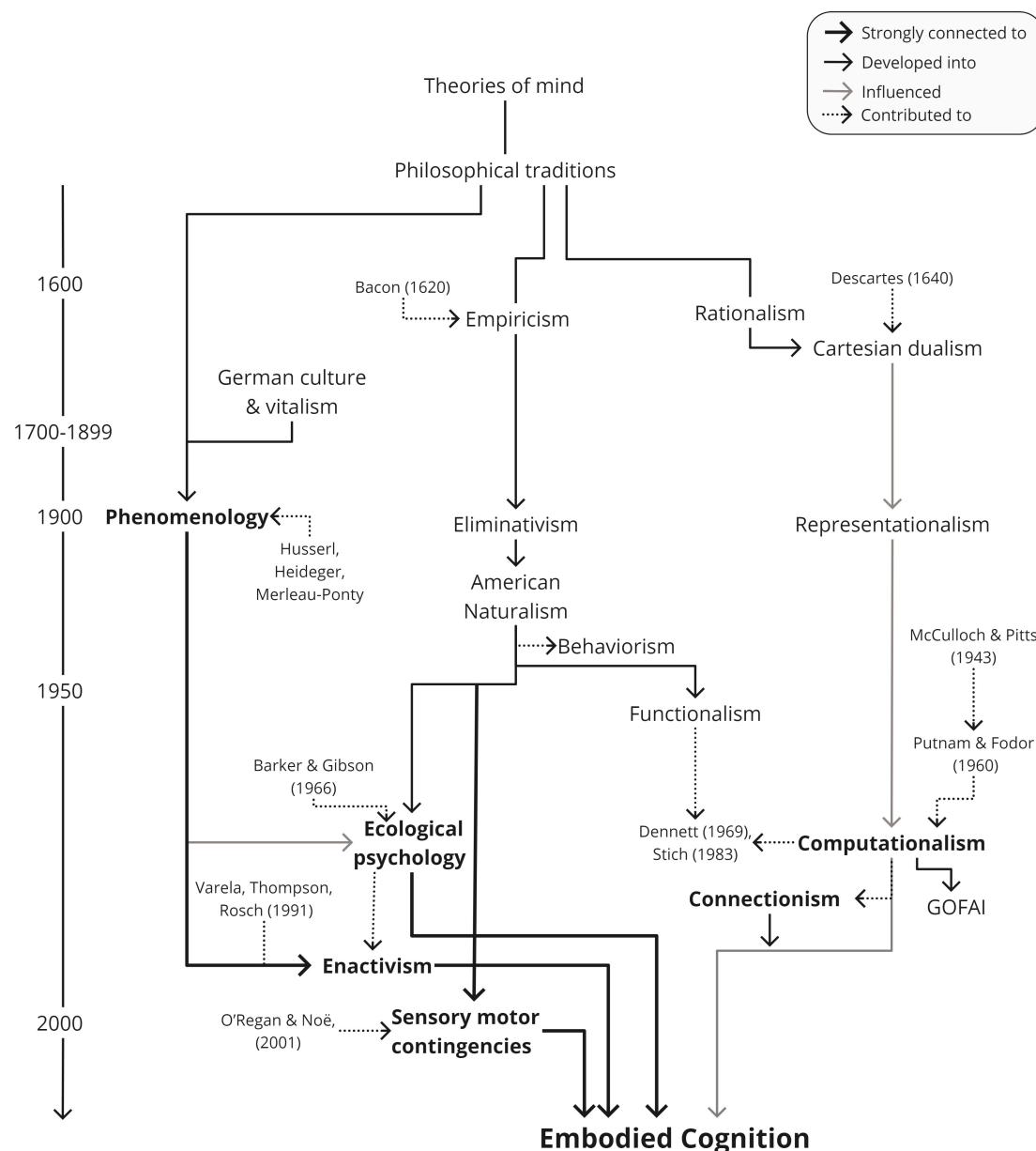
Embodied Cognition's Google Document

The screenshot shows a Google Document titled "Edits Embodied Cognition". The document content discusses the appreciation of the phenomenological mindset and its influence on cognition. It mentions J.J. Gibson's theory on ecological psychology and connectionism. A sidebar on the right displays a list of edits made by "John Jairo Madrid Carvajal" on October 21, 2021, including adding a section about the history of embodied cognition and committing changes to Wikipedia.

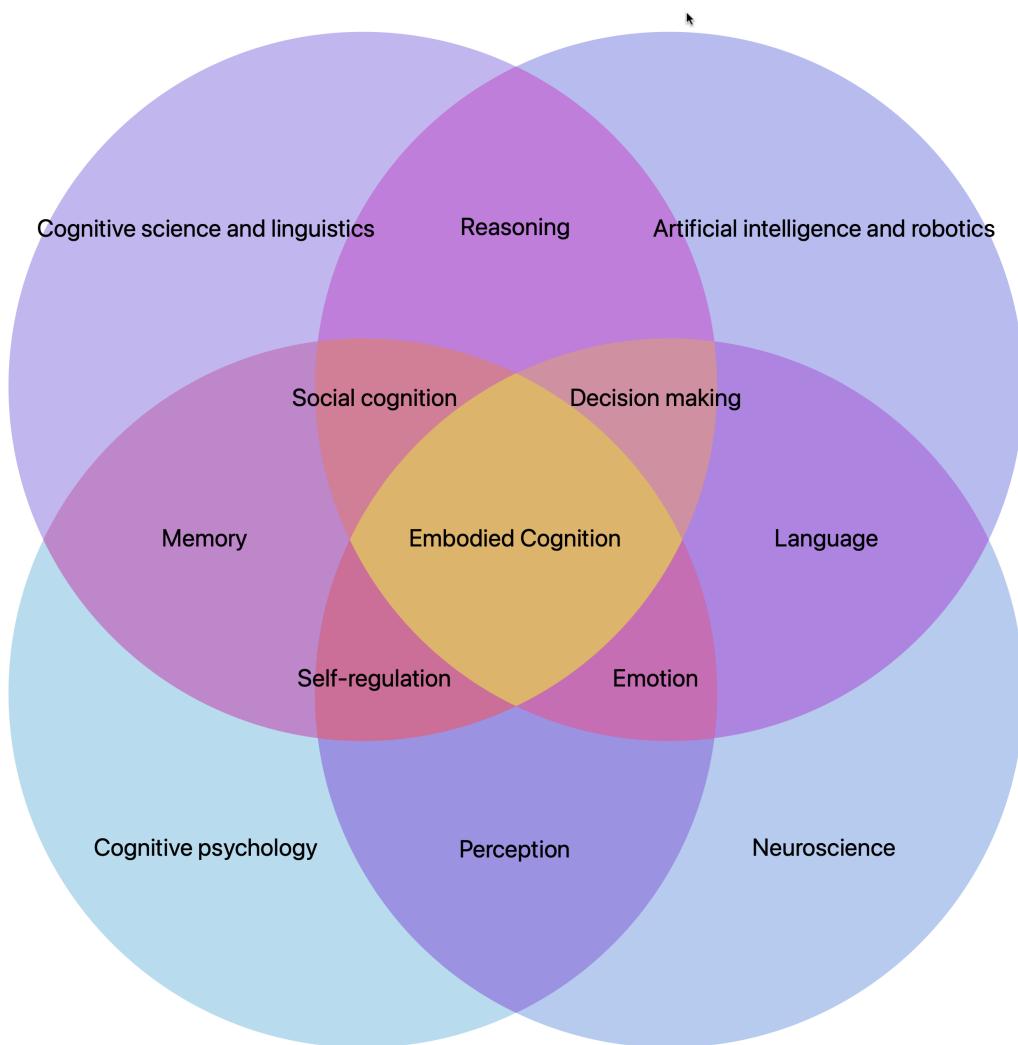
The document text includes:

- The appreciation of the phenomenological mindset allows us to not overlook the influence that phenomenology's speculative but systematic reflection on the mind-body-world relation had in the growth and development of the core ideas which embodied cognition comprises. From a phenomenological perspective "all cognition is embodied, interactive, and embedded in dynamically changing environments".^[22] These constitute the set of beliefs which proponents of embodied cognition such as Francisco Varela, Eleanor Rosch, and Evan Thompson will revise later on and seek to reintroduce in the scientific study of cognition under the name of enaction.^[23] Enactivism reclaims the importance of considering the biodynamics of the living organism to understand cognition by gathering ideas from fields such as biology, psychoanalysis, buddhism, and phenomenology. According to this enactive approach, organisms obtain knowledge by developing their cognitive capacities through perception-action interactions with a determined environment.
- On the bases of empirical grounds, and in opposition to those philosophical traditions that denied the importance of the body to understand cognition, research on embodiment has demonstrated the relation between cognition and bodily processes. Thus, understanding cognition requires us to consider and investigate those sensory and motor mechanisms that enable it. George Lakoff, for example, holds that reasoning and language arise from the nature of our bodily experiences and, thus, even our own metaphors have bodily references (Lawler et al., 1983).
- J.J. Gibson () developed his theory on ecological psychology that entirely contradicted the computationalist idea of understanding the mind as information processing which by that time had permeated psychology—both in theory and practice. Gibson particularly disagreed with the way his contemporaries understood the nature of perception. While computationalism considers perceptual objects as an unreliable source of information upon which the mind must do some sort of inference, Gibson considers perceptual processes as the product of the relation between a moving agent and its relationship with a determined environment (Gibson, 1950).
- Connectionism also put forth a critique to the computationalist commitments yet granting the possibility of some sort of non-symbolic computational processes to take place (Haffield, 1991). According to the connectionist thesis, cognition as a biological phenomenon can be explained through the interaction and dynamics of artificial neural networks (ANNs) (Buckner & Garson, 2019) (Flusberg et al., 2010). However, given the traces of abstraction that remain in the inputs and outputs through which connectionist neural networks carry its computations, connectionism is said to be not so far from computationalism and unable to cope with both the challenge of dealing with the details involved during perceiving and acting and explain higher level cognition (Calvo & Symons, 2014) (Fodor & Fodor, 1987). Likewise, although connectionism's take on cognition is biologically inspired by the behavior and interaction of single neurons, its connections to embodiment thesis are not clear-cut.
- More recently, O'Regan, J. K. and Noé, A. provide empirical evidence against the computationalist mindset arguing that although cortical maps exist in the brain and their patterns of activation give rise to perceptual experiences, this does not fully explain the subjective character of said experiences. Namely, it is unclear how internal representations generate conscious perception. Given this ambiguity, O'Regan, J. K. and Noé, A. put forth what will be known as "sensorimotor contingencies" (SMCs) in an attempt to understand the changing

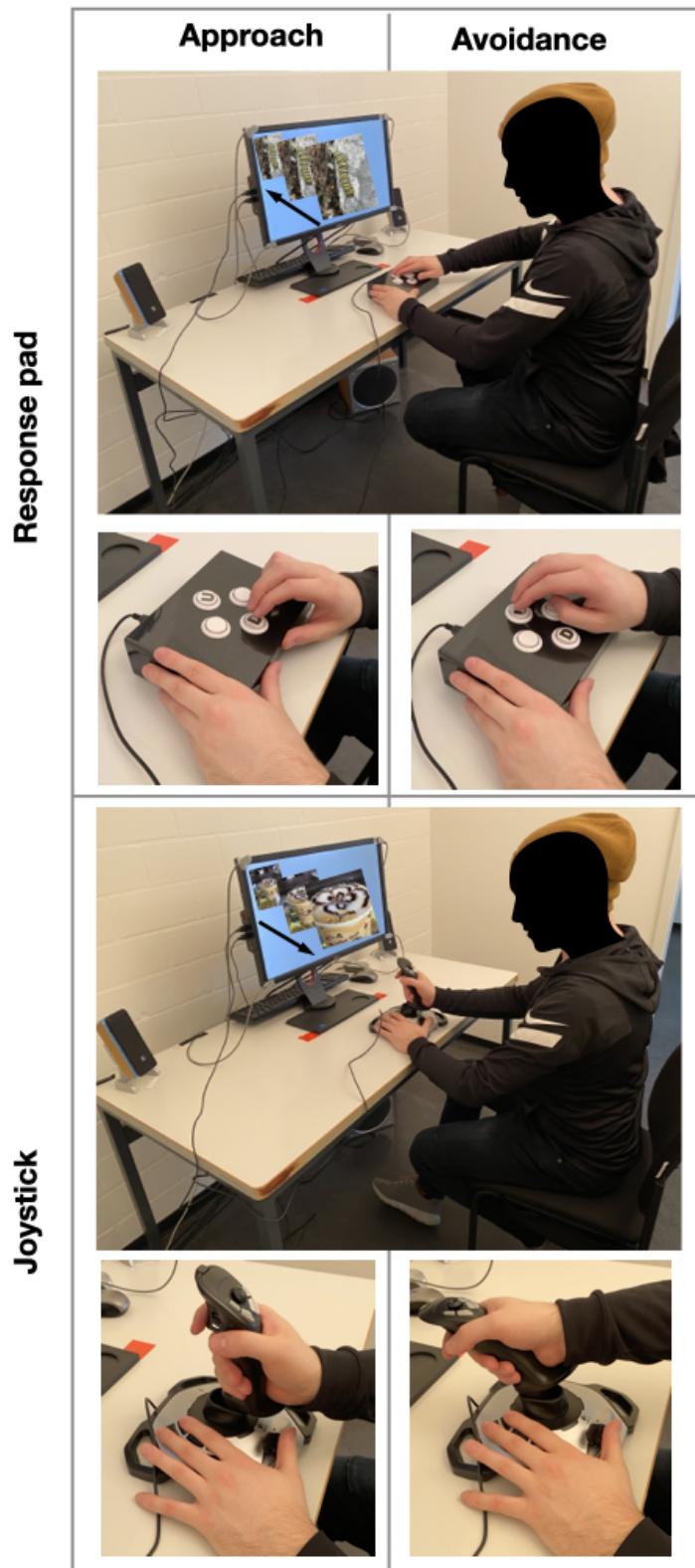
Note. Screenshot of the Google document created to share members' edits progress and add suggestions. It may require access permissions, and it is available at <https://docs.google.com/document/d/10Ot9HqaQ9RARD5t-FqBey4mFwYB7QBkWt4vmsYjSjA/edit#heading=h.7s331uh5dmo>

Figure 6*History Timeline of Embodied Cognition*

Note. This history timeline image was created using the Miro board, which may require access permissions and is available at https://miro.com/app/board/o9J_l4LUXvc=/

Figure 7*The Scope of Embodied Cognition*

Note. This image was created using HTML empowered by amCharts 4. The respective HTML, JS, and CSS code to generate the image are available in a GitHub repository at https://github.com/JohnMadrid/EC_env_images/tree/main/content-diagram

Figure 8*The Approach and Avoidance Task (AAT)*

Note. Image created using Keynote. The GIF version is available on Wikipedia at https://upload.wikimedia.org/wikipedia/commons/archive/4/48/20220524191836-%21Approach_and_avoidance_task.gif

Figure 9*The Change Blindness Effect*

Note. Image created using Keynote. In this report, images are placed side by side, but the GIF version displays one image after the other. It is available on Wikipedia at https://upload.wikimedia.org/wikipedia/commons/7/7f/Change_blindness_illusion.gif

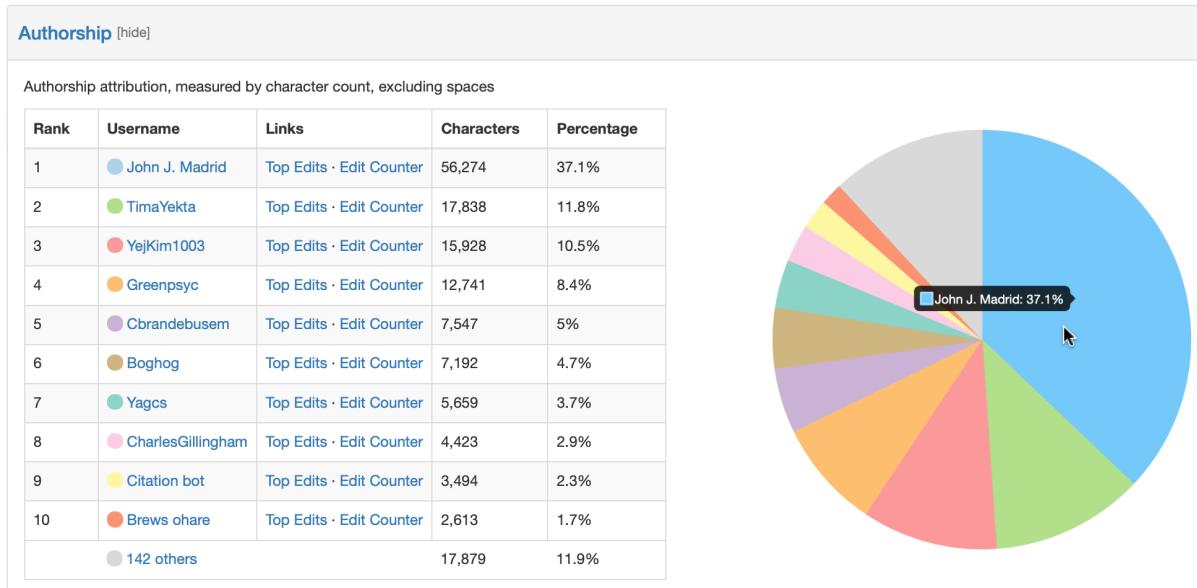
Figure 10*Embodied Cognition Theory Infobox*

Embodied cognition	
	
Details	
Theory of	Cognition
Key concepts	Body · Mind · Environment · Affordance · Sensorimotor functions
Origin	20th century
Cognitive features	Concepts · Categories · Perception · Language · Memory · Learning · Reasoning · Emotion · Self-regulation · Social cognition · Sensorimotor contingencies
Bodily aspects	Motor system · Perceptual system · situatedness · Intrinsic assumptions
General	
Related fields	Cognitive science · Cognitive psychology · Cognitive neuroscience · Situated cognition · Philosophy · Linguistics · AI · Robotics
Applications	Education · Robotics · Clinical settings · Sport · Music · Social psychology
Terminology on cognition [edit on Wikidata]	

Note. Image of the Infobox created directly on Wikipedia using common format code of pairs of parameter/name and associated attribute/value. It is available on Wikipedia at https://en.wikipedia.org/w/index.php?title=Template:Infobox_Theory&action=edit

Figure 11

Embodied Cognition Authorship Attribution, Measured by Character Count (Excluding Spaces)

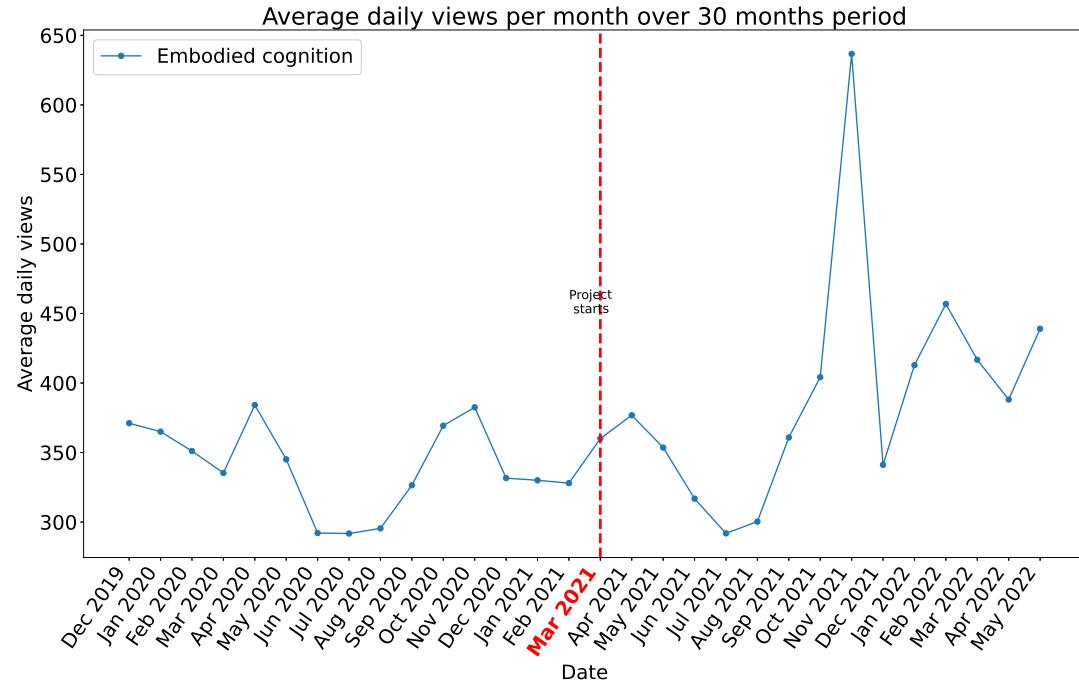


Note. This image is generated by Wikipedia's statistics page. It is available on Wikipedia's Xtools page at

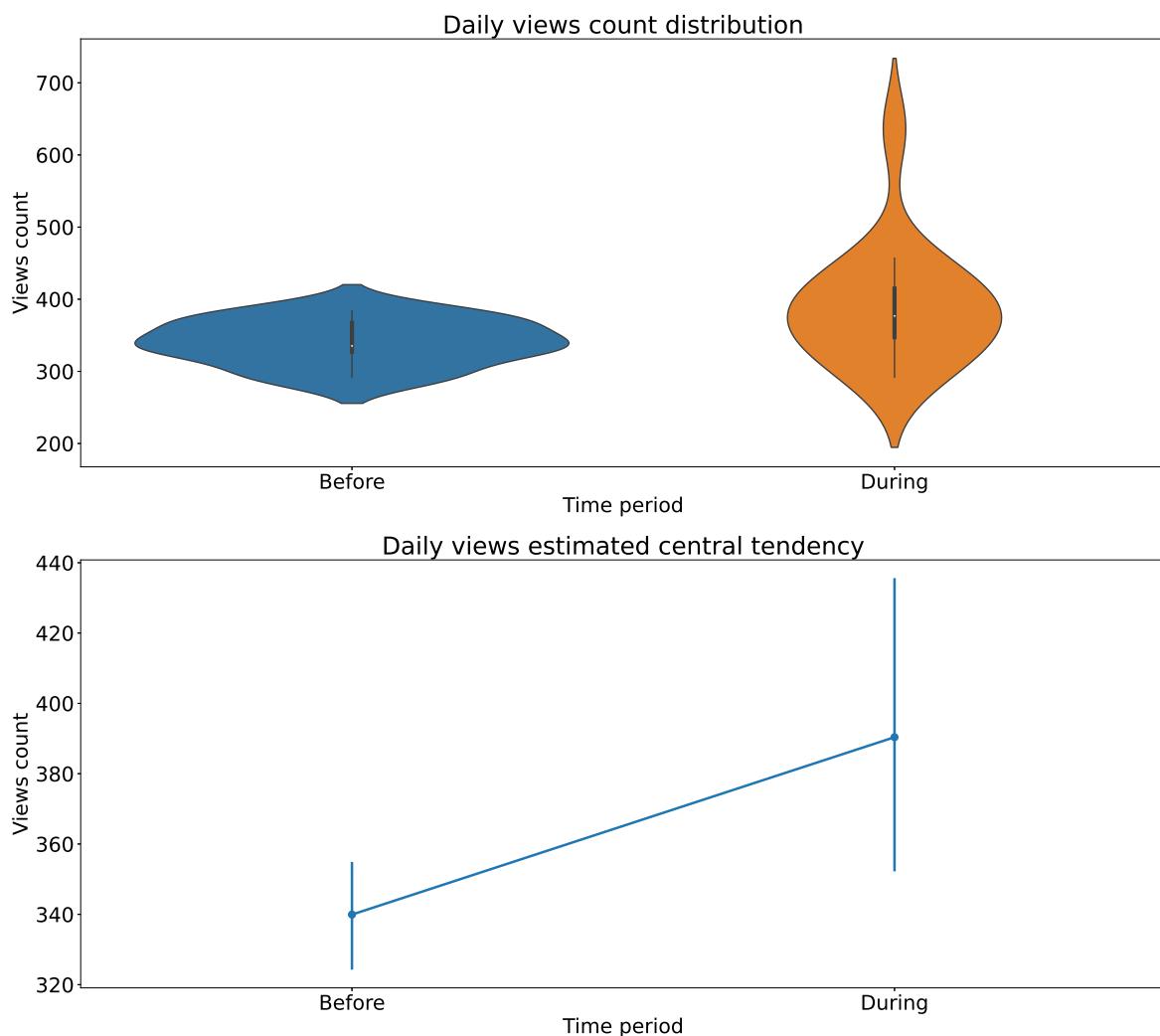
<https://xtools.wmflabs.org/authorship/en.wikipedia.org/Embodied%20cognition/>

Figure 12

Pageviews Average Daily Views per Month over 30 Months Period



Note. This image was created in PyCharm using Wikipedia's pageviews data. It is available in the GitHub repository of this project at https://github.com/JohnMadrid/EC_env_images/tree/main/WikiPageAnalysis/Images

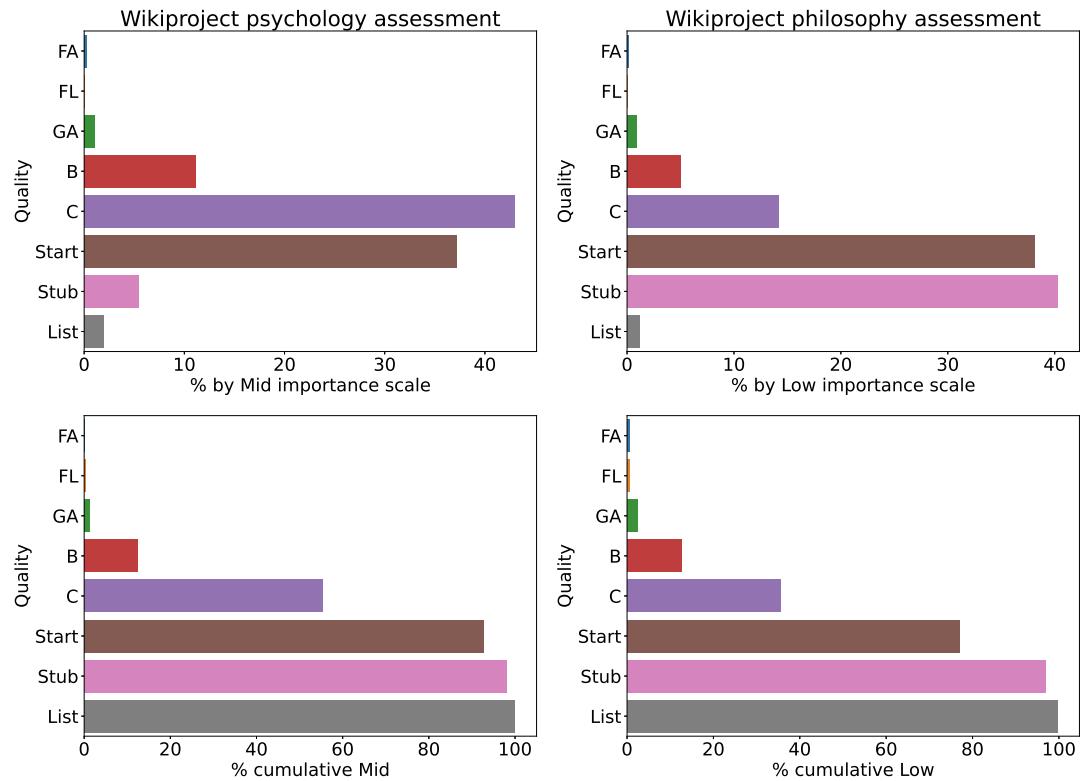
Figure 13*Daily Views Count Distribution and Estimated Central Tendency*

Note. This image was created in PyCharm using Wikipedia's pageviews data. It is available in the GitHub repository of this project

https://github.com/JohnMadrid/EC_env_images/tree/main/WikiPageAnalysis/Images

Figure 14

Psychology and Philosophy Wikiprojects' Quality Scale



Note. This image was created in PyCharm using Wikipedia's Wikiprojects' assessment data. It is available in the GitHub repository of this project at https://github.com/JohnMadrid/EC_env_images/tree/main/WikiPageAnalysis/Images and the data is available at https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Psychology/AssessmentImportance_scale

Appendix A

Protocols

Protocol 05

Universität Osnabrück • Study Project: “Embodied Cognition on Wikipedia” (I) • Ss 2021 • Minutes by John Madrid

Meeting 24th June 2021 09:15AM – 10:55AM

Organizational:

- Meetings take place every 15 days at 09:15 AM.
- Edits must be discussed with others before the meeting.
- The new structures for the psychology and reasoning section were approved.
- The neuroscience section will be moved before AI.
- We will explore the possibility of the entrance to receive a better ranking.

John

1. presented the Objective and Key Results (OKR's)

It is an interactive board that will help us:

- Better understand the structure of the project “Embodied Cognition on Wikipedia”.
- Identify things we need to change, restructure, re-write, add, and delete.
- Keep track of changes and edits done on Wikipedia.

• Usage:

- Yellow = main headers
- Mustard = sub-headers
- Green = discussion/ideas/Todos
- Pink = New inclusions or possible solutions to something.
- White = activities
- (This categorization is defined bellow the OKR's chart in the miro board.)

2. Objective: new structure for the psychology and reasoning section

John presented the proposal for the restructure of the Psychology and Reasoning sections as previously discussed with **Yeji** and **Charlotte**.

Results:

- The psychology section will receive the new name “Cognitive psychology”.
- The reasoning section paragraph will be rewritten and moved inside the “cognitive psychology” section.
- All other subsections from the “reasoning” section will be rewritten and rearranged inside the “Cognitive psychology” section (see Fig. 1).
- New headers for the new “cognitive psychology” section:
 - Decision making, Language (?), Perception, Learning, Memory, Social cognition

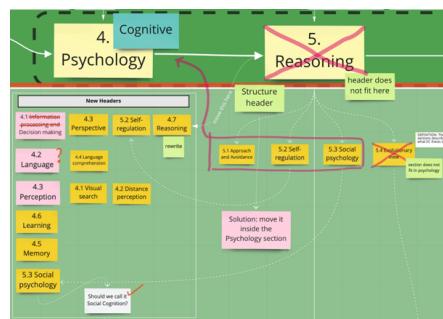


Figure 1 New structure for “Cognitive psychology”

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3. History section

Some literature has been reviewed and there is some material to start writing this section.

John, Yej & Charlotte

- A new “applications of embodied cognition” section is under construction.
- Some examples have been identified:
 - Educational, clinical, and industrial settings.
 - Math classes scenarios, FeelSpace belt, Phantom Limb.

Charlotte

- Presented her edits on the “Neuroscience” section
- Some of the changes were already on Wikipedia and they were just presented and discussed in the section.
- John presented a new edit paragraph for this Neuroscience section.
 - Paragraphs will be revised and commented on before editing on Wikipedia.

Yej

- presented a new edit on the perception section combining and nicely summarizing the current “visual search” and “distance perception”.
- Edits will be discussed and uploaded on Wikipedia.

Yosindra & Ali

- They are working on the “Artificial intelligence” section.
- So far, they have discussed and identified the topics and parts that need to be changed.
- They are currently working on a more concrete and finished proposal that would be ready in a couple of days.

Ali

- He has done some major edits in the “Memory” section.
- After discussion and given the feedback, he has received from Charlotte and Ricarda, the edits are approved to be uploaded after working out the comments.

John

- By the end, the idea of improving the actual ranking (C) of the “Embodied Cognition” entrance was discussed:
- We will look at examples of high-ranked articles.
 - Fateme mentioned for example the Agriculture and Evolution entrances.
- We will set a path to make the entrance achieve a higher rank on the quality scale.
 - The [WikiProject Psychology](#) contains more detailed information on the things we need to achieve.

Protocol 07

Universität Osnabrück • Study Project: “Embodied Cognition on Wikipedia” (I) • Ss 2021 • Minutes by John Madrid

Meeting 22nd September 2021

11:00AM – 14:00AM

Organizational:

- Meetings with Peter take place every 15 days at 09:15 AM
- The next meeting is on Thursday 30.09.2021 at 09:15
- Group members will meet the Thursday that we do not meet with Peter
- Edits **must** be discussed with others **before** meeting

- We will assign tasks/edits that must be on Wikipedia when meeting with Peter
- Improved “Buddy System” => everyone comment system
- We assigned ourselves some edits and tasks on the shared document (see Trello card)
- We have sent an email to Peter informing what we discussed

News:

- We are five members as of today.
 - Study project: John, Fateme, Yeji, and Ali Haydar
 - Interdisciplinary course: Yosindra

EMAIL TO PETER

Dear Peter,

We hope you are doing well. We wanted to apologize for messing up the date for the last meeting. After having a meeting today we came up with the following ideas that we hope will allow us to improve the workflow of the Study Project “Embodied Cognition on Wikipedia” and, therefore, we can be more productive.

- First of all, we realized that we are only five people on the study project (one of which is doing an interdisciplinary course).
- Second, we improved the ‘Buddy system’. For that, we are committing ourselves to review all the suggested edits before meeting with you on Thursdays as usual.
- For that, we have created a shared document where we are all placing our current edit ideas so that **we can see the workflow of each other all the time**. Thus, we can comment anytime, suggest changes, or introduce ideas.
- We have also gone through the Wikipedia entrance, and we have assigned ourselves the tasks we want to have done and on Wikipedia to present them to your next meeting.
- We put a reference to our shared Doc on Trello.
- We will meet regularly as a group to discuss edit ideas before meeting with you.
- Finally, we discussed John’s images for the entrance, and he will temporarily upload them on Wikipedia.

Once again, we apologize for the confusion, and we look forward to our next meeting on Thursday 30.09.2021

Best,
John, Fateme, Yeji, and Ali Haydar

Protocol 08

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Meeting 24th June 2021
15:30 – 16:45

Organizational:

- Meetings take place every 15 days at 09:15 AM.
 - The next meeting is on October 29th, 2021, at 09:15 AM.

- Edits must be discussed with others before the meeting.
- We are still working on the shared GoogleDoc (refer to Trello board)
- Some history changes to the EC entrance were discussed.
- Each member discussed the state of his/her edits.
- New edits ideas and tasks were assigned.
- Re-structure of section 6 “Cognitive science and linguistics”.
- Updates to the EC OKRs in the Miro board have been done.

John

1. Presented the final edits for the “History” section.

The history section is completed with some final paragraphs regarding Enactivism, Connectionism, and 4E cognition. Additionally, the two images regarding the history timeline and the scope of embodied cognition were added to the Wikipedia entrance.

2. Add complementary information to the “Neuroscience” section.

One proposal I will explore is the role of sensorimotor system in embodied cognition. The idea is to find papers that aboard this issue showing how there is an increasing amount of research exploring the role of the motor system in cognition. Also, the topics of neuronal Dynamics for EC will be explored as a possible edit. Thus, maybe Peter knows of additional topics missing regarding Neuroscience and Embodiment.

Yeji

1. Presented a new additional paragraph for the learning section.

The paragraph introduces the topics Ali will go into more detail later in the section. This paragraph will be uploaded to the Wiki entrance and John will try to restructure it so that it can connect with the rest.

2. Emotion section will include a new “emotion and abstract concepts” section that currently appears in the “Cognitive science” section.

For this the idea is to find the appropriate location in the current “Emotion” section and look for possible edits (where necessary), avoid redundancy, and convey ideas clearly.

Yosindra

1. Presented the fact that the history section has had some adjustment by someone external.

New subsections inside subsections were unnecessarily created. This will be reedited, and the history of AI will become a section showing the relation between AI and Robotics with Embodied Cognition.

2. A new proposal for what and how to write this section will be investigated and a paragraph for that will be desirable.

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Ali

- Presented the paragraphs that he worked on for the learning section. This is already uploaded to Wikipedia.

More improvements on those paragraphs are yet to come in accordance with John’s comments.

- **A new closing paragraph for the section will be the task for next week.**

Fateme

- **Presented the edits on the Learning section which are already on Wikipedia.**

Some of the paragraphs inside the sections are being considered for the “Applications” sections. This will be moved later when the section is completed.

- **The creative commons image was added to the learning section accordingly.**
- **The Reasoning section is currently under editing.**

Some paragraphs and connecting ideas have been added to the role of the motor system during reasoning. Similarly, some examples regarding the connection between gestures and reasoning are under development and the corresponding references will be added.

- Section 6 will be re-structured. The idea is to investigate proposals for what to do and how to improve it.
-

Protocol 09

Universität Osnabrück • Study Project: “Embodied Cognition on Wikipedia” (II) • Ws 2021 • Minutes by John Madrid

Meeting 28th October 2021
09:15 – 11:15**Organizational:**

- Meetings take place every 15 days at 09:15 AM.
 - The next meeting is on November 11th, 2021, at 09:15 AM.
- Edits must be discussed with others before the meeting.
- We are still working on the shared GoogleDoc (refer to Trello board)
- Some statistics and history changes to the EC entrance were discussed.
- Each member presented her/his (mostly finished) edits.
- Restructure the EC Wikipedia entrance (part 1) DONE.
- Restructure the EC Wikipedia entrance (part 2) BEGINS.
- Individual tasks were assigned.
- Updates to Trello and EC OKRs in the Miro board have been done.

Key topics and improvements:

- Study project group members presented to prof. Koenig a summary of the previously discussed updates and edits achieved by each member until now (See Protocol 08). This brings us to the next point:

- The “*Restructure of the EC Wikipedia entrance (part I)*” has been finalized (see Trello card). This concerned mostly the “History” and the “Cognitive psychology” sections.
- Sections already (hugely) improved include sections 3, 4, 5, and 7 (as well as the subsections 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8 and 7.1). (fig. 1).
- Images and a video have been added to the entrance.
- **Restructure the EC Wikipedia entrance (part 2) STARTS.** It was pointed out that the “Cognitive psychology” section is getting most of the attention since all cognitive capacities are listed under it. This is particularly problematic and unfair to the other sciences because they also investigate these aspects of cognition, and no credit has been given to them (fig. 1). A solution is to undergo a second restructuring of the entrance content table as follows:
 - o All sciences and their connection to embodiment will be mentioned in separate paragraphs inside the “*The scope of embodied cognition*” section. This will emphasize the interdisciplinary and joined work done by each science to investigate cognition from an embodied perspective.

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 (II) Ws 2021 Minutes by John Madrid

Fig. 1 Content table of the EC entrance after structural changes part I.

- o All cognitive capacities (subsections 5.1 to 5.9 and 7.1) will be listed below section 4, each as a header.
- o Other editors will be informed in advance about the edits that will take place. For that, Wikipedia tools such as hidden comments and the “Talk” section will be used. “*Hidden comments*” will be inserted around the sections where changes will be done. These will be invisible to readers and only visible to editors under “Edit” mode. The “Talk” section is another way to publicly let other editors know about the changes, avoid future conflict or disagreements, and hear others’ opinions and possible feedback.

Others:

- Creating a virtual environment with a humanoid created in Blender to make images was proposed (see Trello card). The humanoid prototype is under development (John) and this idea will only be tried out aside, it will not constitute a major effort.

Contents [hide]
1 Embodiment thesis 2 Philosophical background 3 History 4 The scope of embodied cognition 5 Cognitive psychology <ul style="list-style-type: none"> 5.1 Perception 5.2 Language 5.3 Memory 5.4 Learning 5.5 Reasoning 5.6 Emotion 5.7 Self-regulation 5.8 Social cognition 5.9 Evolutionary view 6 Cognitive science and linguistics <ul style="list-style-type: none"> 6.1 Conceptual metaphor 6.2 Image schema 6.3 Prototypes 7 Neuroscience <ul style="list-style-type: none"> 7.1 Sensorimotor contingencies 8 Artificial intelligence and robotics <ul style="list-style-type: none"> 8.1 History of artificial intelligence 8.1.1 Limits of symbolic AI 8.1.2 Moravec's paradox 8.2 Embodied approaches to artificial intelligence 8.2.1 Solving problems of perception and locomotion directly 8.2.2 Embodied AI research 8.3 Future of Embodied AI 9 Criticisms <ul style="list-style-type: none"> 9.1 Infants as examples 9.2 Overinterpretation? 10 Six views of embodied cognition <ul style="list-style-type: none"> 10.1 Criticism of the six claims 11 See also 12 References 13 Further reading 14 External links

Appendix B

Literature Review References

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Appendix C

New Theory and History Sections

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Embodied Cognition on Wikipedia content changes

Embodiment thesis section

Proponents of the embodied cognition thesis emphasize the active and significant role the body plays in the shaping of cognition and in the understanding the importance of an agent's mind and cognitive capacities. In philosophy, embodied cognition holds that an agent's cognition, rather than being the product of mere (innate) abstract representations of the world, is strongly influenced by aspects of an agent's body beyond the brain itself (R. A. Wilson & Foglia, 2011).¹² Thus, the embodiment thesis intends to reintroduce an agent's bodily experiences into any account of cognition. It is a rather broad thesis and encompasses both weak and strong variants of embodiment (Chemero, 2009; Shapiro, 2019; Varela et al., 1992; A. D. Wilson & Golonka, 2013). In their attempt to reconcile cognitive science with human experience, Varela et al.'s enactive approach to cognition defines "embodiment" as follows:¹³

"By using the term *embodied* we mean to highlight two points: first that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological and cultural context."

— Francisco J. Varela, Evan Thompson, Eleanor Rosch: *The Embodied Mind: Cognitive Science and Human Experience* pages 172–173

This double sense that Varela et al. attribute to the thesis of embodiment emphasizes the many aspects of cognition that researchers in different fields —such as philosophy, cognitive science, AI, psychology and neuroscience— are involved with. This general characterization of embodiment faces some difficulties: A consequence of this emphasis on the body, experience, culture, context and the cognitive mechanisms of an agent in the world is that often distinct views and approaches to embodied cognition overlap. Indeed, for example, the theses of extended cognition and situated cognition are usually intertwined and not always carefully separated. Similarly, since each of these aspects of the embodiment thesis is endorsed to different degrees, embodied cognition should be better seen as a research program rather than an unified well-defined theory (Shapiro, 2019).

Some authors explain the embodiment thesis by arguing that cognition depends on an agent's body and its interactions with a determined environment. Accordingly, cognition in real biological systems is not an end in itself but is constrained by the system's goals and capacities. However, they argue, such constraints do not mean cognition is set by adaptive behavior (or *autopoiesis*) alone, but rather that cognition requires "*some kind of information processing... the transformation or communication of incoming information*". The acquiring of such information involves the agent's "*exploration and modification of the environment*" (Miłkowski, 2013).¹⁴

"It would be a mistake, however, to suppose that cognition consists simply of building maximally accurate representations of input information...the gaining of knowledge is a stepping stone to achieving the more immediate goal of guiding behavior in response to the system's changing surroundings."

— Marcin Miłkowski: *Explaining the Computational Mind*, p. 4

Another approach to understand embodied cognition comes from a narrower characterization of the embodiment thesis. The following narrower view on embodiment does not only avoids

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Commented [C3]: I would personally leave the sentence as it was in the Wikipedia article.

Commented [JM4R3]: I will consider it.

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any compromises to external sources other than the body, but also allows differentiating between embodied cognition, extended cognition, and situated cognition. Thus, we can specify the embodiment thesis as follows (R. A. Wilson & Foglia, 2011):^[4]

Embodiment thesis: Many features of cognition are embodied in that they are deeply dependent upon characteristics of the physical body of an agent, such that the agent's beyond-the-brain body plays a significant causal role, or a physically constitutive role, in that agent's cognitive processing.

—RA Wilson and L Foglia, *Embodied Cognition* in the Stanford Encyclopedia of Philosophy

This thesis points out the core idea that an agent's body plays a significant role in shaping different features of cognition such as perception, attention, memory, reasoning among others. Accordingly, these features of cognition depend on the kind of body an agent has. Furthermore, it omits direct mention of those aspects of the "more encompassing biological, psychological and cultural context" included by Varela *et al.* and, therefore, makes possible to separate embodied cognition, extended cognition and situated cognition.

In contrast to the *embodiment thesis*, the *extended mind thesis* limits cognitive processing neither to the brain nor even to the body, it extends it outward into the agent's world (Clark & Chalmers, 1998; R. A. Wilson & Foglia, 2011).^{[5][6]} *Situated cognition* emphasizes that this extension is not just a matter of including resources outside the head but stressing the role of probing and changing interactions with the agent's world (Clark, 2008).^[7] Cognition is situated in that it is inherently dependent upon the cultural and social contexts within which it takes place (Cobb, 2001).^[8]

This conceptual reframing of cognition as an activity influenced by the body has had significant implications. For instance, the view of cognition inherited by most contemporary cognitive neuroscience is internalist in nature. An agent's behavior along with his capacity to maintain (accurate) representations of the surrounding environment were considered as the product of "powerful brains that can maintain the world models and devise plans" (Haselager et al., 2008).^[9] From this perspective, cognizing was conceived as something that an isolated brain did. In contrast, accepting the role the body plays during cognitive processes allows us to account for a more encompassing view of cognition. This shift in perspective within neuroscience suggests that successful behavior in real-world scenarios demands the integration of several sensorimotor and cognitive (as well as affective) capacities of an agent. Thus, cognition emerges in the relationship between an agent and the *affordances* provided by the environment rather than in the brain *alone*.

In 2002, a collection of positive characterizations summarizing what the embodiment thesis entails for cognition were offered. Margaret Wilson argues that the general outlook of embodied cognition "displays an interesting co-variation of multiple observations and houses a number of different claims: (1) cognition is situated; (2) cognition is time-pressured; (3) we off-load cognitive work onto the environment; (4) the environment is part of the cognitive system; (5) cognition is for action; (6) offline cognition is bodily-based" (M. Wilson, 2002).^[10] According to Wilson, the first three and the fifth claim appear to be at least partially true, while the fourth claim is deeply problematic in that all things that have an impact on the elements of a system are not necessarily considered part of the system.^[11] The sixth claim has received the least attention in the literature on embodied cognition, yet it might be the most

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significant of the six claims as it shows how certain human cognitive capabilities, that previously were thought to be highly abstract, now appear to be leaning towards an embodied approach for their explanation.^[12] Wilson also describes at least five main (abstract) categories that combine both sensory and motor skills (or sensorimotor functions). The first three are working memory, episodic memory, and implicit memory; the fourth is mental imagery, and finally, the fifth concerns reasoning and problem-solving.

The Extended mind thesis, in contrast to the Embodiment thesis, limits cognitive processing neither to the brain nor even to the body but extends it outward into the agent's world.^[13] Situated cognition emphasizes that this extension is not just a matter of including resources outside the head, but stresses the role of probing and modifying interaction with the agent's world.^[14]

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Commented [C6]: Maybe you could make this a link in the Wikipedia article. It is not so far.

Commented [JM7R6]: Yes. PENDING.

Commented [C8]: I would move this distinction between the theses upward to the part where you mention that the theses are often entwined and not clearly separated. It would be a nice clarification at that point. I found it strange to have that explanatory paragraph at the end of the section and only have the corresponding links to the Wikipedia pages in the paragraphs above...

Commented [JM9R8]: I consider that only until here it makes sense to introduce this distinction. Once the "more precise" definition of embodiment is given, it's easy to see the differentiation. If we move it upwards, it is not so clear makes the paragraph longer and moves reader attention into another topic.

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<https://plato.stanford.edu/archives/fall2011/entries/embodied-cognition/>

Next week 20.05.21

Tasks:

- **General:**
 - o Finalize the embodiment thesis section.
- **Specifics:**
 - o Find references for "weak and strong" variants of the embodiment thesis.
 - o Find information and reference for "Dawson" and include or exclude it from the text.
 - o Fill the gap between the last two paragraphs of the embodiment thesis section.
 - o Add two paragraphs at the end of the embodied cognition section introducing the "narrower" characterization of embodiment. Also, deleted mention to Dawson since the source is unclear and does not appear on the entrance's references (see hidden comment)
 - o Upload section final version on Trello and wait for both feedback and green light to edit the entrance.
 - Upload edited entrance to Wikipedia.
- **Proposals** to introduce in the Wikipedia entrance on embodied cognition:
 - o Include the "Embodied cognition" paper
 - very short and precise introduction on embodiment theory, practice and methods for investigating embodiment.
 - No Altmetric
 - In connected papers
<https://www.connectedpapers.com/main/52447ca23d4e7c7a0b902a5feeda74a0cf85d798/Embodied-cognition/graph>
 - 28/404 highly influential references.
 - <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8311486>

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Notes:

- This constitutes the first sketch for the new “History” section.
- Sub-headers are just for pedagogical purposes; they will not appear in the wiki, just in the corresponding paragraph.
- The gray-colored section is still under development.

TODOs

- Find, review, and document literature on the history of EC.
- Summarize main ideas.
- Write section.

History

Introduction

The theory of embodied cognition, along with the multiple aspects it comprises, can be regarded as the imminent result of an intellectual skepticism towards the flourishing of the disembodied theory of mind put forth by René Descartes in the 17th century. According to Descartes' dualism, the mind is entirely distinct from the body and no aspect of the later is indispensable for a successful explanation of the former (Descartes, 1996).

Commented [JM10]: Cite the wiki entrance on the topic

Body

Research has been done to identify the set of ideas that would establish what could be considered as the early stages of embodied cognition around inquiries regarding the soul-body-mind relation and vitalism in the German tradition from 1740 to 1920 (Finkelstein, 2017). However, embodied cognition, as it is conceived nowadays, has a relatively short history (McNerney, n.d.). We can trace back the intellectual underpinnings of embodied cognition to the influence of philosophy, and more specifically, the phenomenological tradition, psychology, and connectionism in the 20th century.

Commented [JM11]: Wiki entrance will be referenced

Details

Phenomenologists such as Edmund Husserl (1859-1938), Martin Heidegger (1889-1976), and Maurice Merleau-Ponty (1908-1962) were a great source of inspiration for what would later be known as the embodiment thesis. They stood up against the mechanistic and disembodied approach to the explanation of the mind by emphasizing the fact that there are aspects of our human experiences (consciousness, cognition) that cannot simply be explained by a model of the mind as computation of inner symbols. From a phenomenological standpoint, such aspects remain unaccountable if we deny the fact—as dualism does—that they “are deeply rooted in the physical nuts-and-bolts of the interacting agent” (Gomila & Calvo, 2008). Maurice Merleau-Ponty in his “*Phenomenology of Perception*” (French: *Phénoménologie de la perception*), for example, rejects the cartesian idea that our primary mode of being in the world is “thinking” (English: *I think, therefore I am*, Latin: *cogito ergo sum*) and proposes corporeity (French: *corporéité*), that is, the body itself as the primary site for knowing the world, and perception as the medium and the pre-reflective foundation of experience.

Commented [JM12]: Wiki entrances will be referenced.
Should I use their lifetime, or should I cite a specific work?

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“The body is the vehicle of being in the world, and having a body is, for a living creature, to be involved in a definite environment, to identify oneself with certain projects and be continually committed to them.” (Merleau-Ponty, 1965)

So stated, the body is the primary condition for experience, it “is my point of view upon the world” which opens up multiple possibilities for being, it “is a knot of living significations”(Merleau-Ponty, 1965).

The appreciation of the phenomenological mindset allows us to not overlook the influence that phenomenology’s speculative but systematic reflection on the mind-body-world relation had in the growth and development of the core ideas which embodied cognition comprises. From a phenomenological perspective “all cognition is embodied, interactive, and embedded in dynamically changing environments” (Shapiro & Spaulding, 2021). These constitute the set of beliefs which proponents of embodied cognition such as Francisco Varela, Eleonor Rosch, and Evan Thompson will later on revise and seek to reintroduce in the scientific study of cognition. These constitute the set of beliefs which proponents of embodied cognition such as Francisco Varela, Eleonor Rosch, and Evan Thompson will revise later on and seek to reintroduce in the scientific study of cognition under the name of enaction.^[23] Enactivism reclaims the importance of considering the biodynamics of the living organism to understand cognition by gathering ideas from fields such as biology, psychoanalysis, Buddhism, and phenomenology. According to this enactive approach, organisms obtain knowledge or develop their cognitive capacities through perception-action interactions with a determined environment. (Varela et al., 1992).

[On the bases of empirical grounds....
Perspective more theoretically, speculative approach....
A more ... methodological and scientific approach]

This three paragraph are new to the Wikipedia and I have been working on them por a while

On the bases of empirical grounds, and in opposition to those philosophical traditions that denied the importance of the body to understand cognition, research on embodiment have demonstrated the relationship between cognition and bodily process. Thus, understanding cognition requires to consider and investigate the sensory and motor mechanism that enables it. George Lakoff, for example, holds that reasoning and language, arise from the nature of our bodily experiences and, thus, even our metaphors have bodily references (Lawler et al., 1983).

J.J. Gibson () developed his theory on ecological psychology that entirely contradicted the computationalist idea of understanding the mind as information processing which by that time had permeated psychology—both in theory and practice. Gibson particularly disagreed with the way his contemporaries understood the nature of perception. While computationalism considers perceptual objects as an unreliable sources of information upon which the mind must do some sort of inference, Gibson considers perceptual processes as the product of the relation between a moving agent and its relationship with a determined environment (Gibson, 1950).

10.10.21

TASKS:

- Complement the ideas about Enactivism at the end of the paragraph with the closing statements on phenomenology.

Commented [JM13]: Unfinished section. More details on ecological psychology and connectionism to come.

-This part will allow me to connect with the opening sentence of the “closing remarks” paragraph.

-Some ideas linking O'Regan, J. K. and Noë, A. work are still missing here.

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- Write missing paragraph regarding the influence of connectionism in the history of EC
- Write ending section regarding the 4E cognition as a consequence of the acceptance and research on EC
- End of the history section.

Connectionism also put forth a critique to the computationalist commitments yet granting the possibility of some sort of non-symbolic computational processes to take place (Hatfield, 1991). According to the connectionist thesis, cognition as a biological phenomenon can be explained through the interaction and dynamics of artificial neural networks (ANNs) (Buckner & Garson, 2019) (Flusberg et al., 2010). However, given the traces of abstraction that remain in the inputs and outputs through which connectionist carry its computations, connectionism is said to be not so far from computationalism and unable to cope with both the challenge of dealing with the details involved during perceiving and acting and explain higher level cognition (Calvo & Symons, 2014)(Fodor & Fodor, 1987). Likewise, although connectionism's take on cognition is biologically inspired by the behavior and interaction of single neurons, its connections to embodiment thesis are not clear-cut.

More recently, O'Regan, J. K. and Noë, A. () provide empirical evidence against the computationalist mindset arguing that although cortical maps exist in the brain and their patterns of activation give rise to perceptual experiences, this does not fully explain their subjective character. Namely, it is unclear how internal representations generate conscious perception. Given this ambiguity, O'Regan, J. K. and Noë, A. put forth what will be known as "sensorimotor contingencies" (SMCs) in an attempt to understand the changing character of sensations as we act in the world. According to the SMC theory, "the experience of seen occurs when the organism master what we call the governing laws of sensor motor contingency" (O'Regan & Noë, 2001).

Closing remarks

Ever since the late 20th century and recognizing the significant role the body plays for cognition, the embodied cognition theory has gained (an ever increasing) popularity, it has been the subject of multiple articles in different research areas, and the mainstream approach to what Shapiro and Spaulding call the "embodied make-over" (Shapiro & Spaulding, 2021). A consequence of this widespread acceptance of the embodiment thesis is the emergence of 4E features of cognition (embodied, embedded, enacted, and extended cognition). Under 4E cognition is no longer thought of as being instantiated in or by a single organism but rather "It assumes that cognition is shaped and structured by dynamic interactions between the brain, body, and both the physical and social environments." (Newen et al., 2018)

Separate paragraph

In order to understand the idea behind embodied cognition, (Gomila & Calvo, 2008) propose to consider the difference between a game of chess and a game of pool. Chess has been since the 1950's the game per excellence when it comes to explaining how symbol manipulation and computer computation can follow rules and by this means succeed at a chess game. On the contrary, a pool game is quite far from ... only by computational and representational means. There are more elements, phisycal elements that are involved in order to successfully reproduce a pool game – such as the correct or desired bodily position, pressure, the inclination for the stick. All of this encompasses bodily capacities which set the requirement for a (physical) body.

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Embody cognition challenges the mainstream assumptions regarding the representational, symbol based, and computational underpinnings of cognition.

Set the stage...

Methodologies: new section?

Embodied cognition is being explored via the same kind of computational, linguistic, and behavioral methodological procedures and now have shifted towards an embodied approach. Moreover, neuroimaging data has also helped to collect more and more evidence for EC (Gomila & Calvo, 2008)

New formal instruments for the exploration and investigation of embodied cognition.

Commented [JM14]: This is not yet on the entrance. I must find the proper place to put it.

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Appendix D

Article Edits

List of Edits Done by Individual Username

←New search

Username: John J. Madrid Page: Embodied_cognition Max edits: 500

Database: enwiki

Don't resolve redirects
 Allow wildcards in page title (*)
 Page title is case sensitive (only applies when wildcards are used)

Submit

Found 172 edits by **John J. Madrid** on Embodied cognition (12.8% of the total edits made to the page)

- 12:10, 30 May 2022 (diff | hist) . . (+7) . . Embodied cognition /* *AI and robotics* */ *fixed broken link*
- 18:11, 27 May 2022 (diff | hist) . . (**+602**) . . Embodied cognition (*Adding wikilinks for clarification*)
- 09:05, 27 May 2022 (diff | hist) . . (+37) . . Embodied cognition (*MOE fixing words and expressions*)
- 23:03, 26 May 2022 (diff | hist) . . (+217) . . Embodied cognition (*MOE fixing words and expressions*)
- 12:29, 26 May 2022 (diff | hist) . . (-27) . . Embodied cognition (*progress on the MOS:WE*)
- 21:47, 25 May 2022 (diff | hist) . . (+46) . . Embodied cognition /* *Social cognition* */ *translations for non-english titles (inside reference)*)
- 21:34, 25 May 2022 (diff | hist) . . (+7) . . Embodied cognition /* *History* */ *fixed sentence*)
- 21:31, 25 May 2022 (diff | hist) . . (+86) . . Embodied cognition (*rephrased sentence for clarity and added wikilinks*)
- 17:26, 25 May 2022 (diff | hist) . . (+417) . . Embodied cognition (*Added some content and wikilinks for terminology and clarification.*)
- 16:27, 25 May 2022 (diff | hist) . . (-10) . . Embodied cognition /* *Music* */ *Changing non-wiki citation format*)
- 13:20, 25 May 2022 (diff | hist) . . (-150) . . Embodied cognition (*changing non-wiki citation format*)
- 13:07, 25 May 2022 (diff | hist) . . (-156) . . Embodied cognition (*changing non-wiki citation format*)
- 12:42, 25 May 2022 (diff | hist) . . (-117) . . Embodied cognition (*Changing non-wiki citation format*)
- 06:34, 25 May 2022 (diff | hist) . . (-364) . . Embodied cognition (*avoiding et al. usage*)
- 05:56, 25 May 2022 (diff | hist) . . (-23) . . Embodied cognition /* *Theory* */ *avoiding et al. usage*)
- 19:13, 24 May 2022 (diff | hist) . . (+80) . . Embodied cognition /* *History* */ *translations for non-english titles*)
- 18:18, 24 May 2022 (diff | hist) . . (+12) . . Embodied cognition /* *Perception* */ *change blindness illusion image updated*)
- 22:02, 23 May 2022 (diff | hist) . . (+1) . . Embodied cognition /* *Challenges* */ *renamed to "Controversy" to comply with psychology articles*)
- 21:48, 23 May 2022 (diff | hist) . . (-97) . . Embodied cognition (*Removing peacock words, 2nd part*)
- 20:39, 23 May 2022 (diff | hist) . . (-19) . . Embodied cognition (*Removing peacock words*)
- 16:35, 22 May 2022 (diff | hist) . . (-14) . . Embodied cognition /* *AI and robotics* */ *fixed Shakey's wikilink pointing to lisp programming language*)
- 16:29, 22 May 2022 (diff | hist) . . (-16) . . Embodied cognition /* *AI and robotics* */ *meta-prior terminology minor edit*)
- 16:03, 22 May 2022 (diff | hist) . . (-11) . . Embodied cognition /* *Embodiment thesis* */ *renamed for easy navigation following GA1 review*)
- 15:54, 22 May 2022 (diff | hist) . . (+90) . . Embodied cognition /* *Self-regulation* */ *wikilink amodal/multimodal terminology for clarity*)
- 15:02, 22 May 2022 (diff | hist) . . (+10) . . Embodied cognition /* *History* */ *Specified Cartesian dualism*)
- 14:54, 22 May 2022 (diff | hist) . . (+420) . . Embodied cognition /* *Applications* */ *Added some content and wikilinks for terminology and clarification.*)
- 13:45, 22 May 2022 (diff | hist) . . (+105) . . Embodied cognition /* *History* */ *Summarizing the concept and voiding quotes*)
- 18:30, 06 April 2022 (diff | hist) . . (**+794**) . . Embodied cognition /* *Clinical settings* */ *added phantom limb image and reference.*)
- 16:31, 06 April 2022 (diff | hist) . . (+404) . . Embodied cognition /* *AI and robotics* */ *added two images from Wiki commons*)
- 15:29, 06 April 2022 (diff | hist) . . (+124) . . Embodied cognition /* *AI and robotics* */ *external link moved to the "external links section"*)
- 13:10, 06 April 2022 (diff | hist) . . (-50) . . Embodied cognition /* *Sports and Music* */

- 12:30, 06 April 2022 (diff | hist) . . (+50) . . **m** Embodied cognition (*General style and grammar edit to meet Wikipedia MoS*)
- 15:44, 05 April 2022 (diff | hist) . . (-172) . . **m** Embodied cognition (*Reference editing*)
- 15:24, 05 April 2022 (diff | hist) . . (+1) . . Embodied cognition
- 15:23, 05 April 2022 (diff | hist) . . (-2) . . **m** Embodied cognition (*Infobox update*)
- 15:14, 05 April 2022 (diff | hist) . . (+2,738) . . Embodied cognition (*/* Situated robotics */ Added complementary information on embodied AI*)
- 21:57, 06 March 2022 (diff | hist) . . (+21) . . Embodied cognition (*/* Emotion */ added link to electromiografy wiki entrance*)
- 22:18, 05 March 2022 (diff | hist) . . (+164) . . Embodied cognition (*/* Education */ Content edit for better readability*)
- 20:46, 05 March 2022 (diff | hist) . . (+0) . . **m** Embodied cognition (*/* Reasoning */ misspelling*)
- 20:34, 05 March 2022 (diff | hist) . . (+915) . . Embodied cognition (*/* Reasoning */ Added a new paragraph on embodied rationality in law and economics theory.*)
- 18:14, 05 March 2022 (diff | hist) . . (+1,044) . . Embodied cognition (*/* Emotion */ Added a complementary study on the embodiment of emotion*)
- 00:16, 05 March 2022 (diff | hist) . . (+26) . . Embodied cognition (*/* Social cognition */ Text edit to improve legibility*)
- 19:09, 04 March 2022 (diff | hist) . . (+11) . . **m** Embodied cognition (*/* Self-regulation */*)
- 19:00, 04 March 2022 (diff | hist) . . (+4) . . **m** Embodied cognition (*/* Emotion */*)
- 18:35, 04 March 2022 (diff | hist) . . (+53) . . Embodied cognition (*/* Emotion */ minor edit to improve readability.*)
- 17:30, 04 March 2022 (diff | hist) . . (+43) . . Embodied cognition (*added education to the application parameter of the Template:infobox*)
- 17:26, 04 March 2022 (diff | hist) . . (+5) . . **m** Embodied cognition (*/* Learning */*)
- 17:25, 04 March 2022 (diff | hist) . . (-3,948) . . Embodied cognition (*/* Learning */ moved paragraphs down to "applied embodied cognition" section*)
- 17:23, 04 March 2022 (diff | hist) . . (+3,948) . . Embodied cognition (*/* Education */ moved paragraphs down from "Learning" section since they are about applications of embodied cognition in education.*)
- 17:19, 04 March 2022 (diff | hist) . . (+29) . . Embodied cognition (*/* Applied embodied cognition */ added subheader for applied EC in education*)
- 16:42, 04 March 2022 (diff | hist) . . (-21) . . Embodied cognition (*/* Learning */ improved readability*)
- 22:50, 03 March 2022 (diff | hist) . . (+149) . . Embodied cognition (*/* Learning */ Wrong reference unrelated to the paragraph fixed.*)
- 22:35, 03 March 2022 (diff | hist) . . (-33) . . Embodied cognition (*/* Learning */ improved readability and joined two paragraphs into one.*)
- 20:25, 03 March 2022 (diff | hist) . . (-20) . . Embodied cognition (*/* Learning */ minor edit to improve readability.*)
- 18:43, 20 February 2022 (diff | hist) . . (-20) . . Embodied cognition (*/* Social cognition */ removed duplicated sentence*)
- 18:29, 20 February 2022 (diff | hist) . . (+4) . . **m** Embodied cognition
- 18:26, 20 February 2022 (diff | hist) . . (+31) . . Embodied cognition (*/* Reasoning */ last paragraph small edit and adjusted images size to match previous images.*)
- 18:01, 20 February 2022 (diff | hist) . . (+290) . . Embodied cognition (*/* Reasoning */ improved gestures paragraph readability.*)
- 12:15, 20 February 2022 (diff | hist) . . (+70) . . Embodied cognition (*/* Reasoning */ reordered entrance sentence, added information, and improved sentences for readability.*)
- 19:12, 19 February 2022 (diff | hist) . . (+264) . . Embodied cognition (*added applications parameter to the Template:infobox*)
- 18:58, 19 February 2022 (diff | hist) . . (+2,069) . . Embodied cognition (*/* Learning */ added information on gestures and respective references.*)
- 17:34, 19 February 2022 (diff | hist) . . (+23) . . Embodied cognition (*/* Learning */ Reversed sentence order for readability.*)
- 17:13, 19 February 2022 (diff | hist) . . (+1,961) . . Embodied cognition (*/* Learning */ Edit paragraph, addded more informationa and respective references.*)
- 20:15, 18 February 2022 (diff | hist) . . (+191) . . Embodied cognition (*/* Learning */ added sentence.*)
- 21:19, 15 February 2022 (diff | hist) . . (-90) . . Embodied cognition (*/* Learning */ edit and removed redundant sentences*)
- 20:31, 15 February 2022 (diff | hist) . . (+113) . . Embodied cognition (*/* Learning */ entrance paragraph edit*)
- 19:57, 15 February 2022 (diff | hist) . . (+1) . . Embodied cognition (*/* Learning */ small reference edit*)
- 23:13, 11 February 2022 (diff | hist) . . (+327) . . Embodied cognition (*/* Memory */ minor reference and text edit*)
- 22:34, 11 February 2022 (diff | hist) . . (-11) . . Embodied cognition (*/* Memory */ editing too detailed and extended information on a single paper.*)
- 22:07, 11 February 2022 (diff | hist) . . (+98) . . Embodied cognition (*/* Scope of embodied cognition */ edit paragraph for better readability*)
- 21:47, 11 February 2022 (diff | hist) . . (+394) . . Embodied cognition (*/* Scope of embodied cognition */ Reference editing*)
- 21:32, 11 February 2022 (diff | hist) . . (+862) . . Embodied cognition (*/* The scope of embodied cognition */ some reference and paragraph editing*)

- 20:18, 11 February 2022 (diff | hist) . . (+6) . . **m** Embodied cognition (*/* The scope of embodied cognition */ Reference editing*)
- 19:33, 11 February 2022 (diff | hist) . . (+325) . . Embodied cognition (*/* Clinical settings */ reference editing*)
- 19:10, 11 February 2022 (diff | hist) . . (-70) . . Embodied cognition (*/* Clinical settings */ added a sentence*)
- 18:54, 11 February 2022 (diff | hist) . . (+113) . . Embodied cognition (*/* Applied embodied cognition */ intro edit*)
- 16:11, 11 February 2022 (diff | hist) . . (+196) . . Embodied cognition (*Reference editing*)
- 15:55, 11 February 2022 (diff | hist) . . (+37) . . Embodied cognition (*/* Sensorimotor contingencies */ improved readability*)
- 15:49, 11 February 2022 (diff | hist) . . (-243) . . Embodied cognition (*/* Sensorimotor contingencies */ Re-used references because they already existed.*)
- 15:21, 11 February 2022 (diff | hist) . . (-431) . . Embodied cognition (*/* Perception */ re-used O'Regan, Noë (2001) reference because it appeared three different times in the reference section*)
- 15:15, 11 February 2022 (diff | hist) . . (-7) . . **m** Embodied cognition (*/* History */ Reference editing*)
- 15:08, 11 February 2022 (diff | hist) . . (+0) . . Embodied cognition (*Undid revision 1071227817 by [[Special:Contributions/Yagcs|Yagcs]] ([[User talk:Yagcs|talk]]) Only first letter is capitalized.*)
- 14:04, 11 February 2022 (diff | hist) . . (-4,187) . . Embodied cognition (*Undid revision 1071224660 by [[Special:Contributions/TimaYekta|Tima Yekta]] ([[User talk:TimaYekta|talk]]) edited version will be added soon*)
- 13:41, 11 February 2022 (diff | hist) . . (-37) . . Embodied cognition (*/* The scope of embodied cognition */ reference editing. cleaned until ref num. 64*)
- 13:32, 11 February 2022 (diff | hist) . . (-153) . . Embodied cognition (*/* The scope of embodied cognition */ reference editing*)
- 13:03, 11 February 2022 (diff | hist) . . (+0) . . Embodied cognition (*/* Applied Embodied Cognition */ capitalization*)
- 20:49, 10 February 2022 (diff | hist) . . (-300) . . Embodied cognition (*/* The scope of embodied cognition */ Re-used references because they already existed.*)
- 20:28, 10 February 2022 (diff | hist) . . (+14) . . Embodied cognition (*/* The scope of embodied cognition */ Reference editing*)
- 20:20, 10 February 2022 (diff | hist) . . (+186) . . Embodied cognition (*/* The scope of embodied cognition */ Reference editing*)
- 20:10, 10 February 2022 (diff | hist) . . (+524) . . Embodied cognition (*/* The scope of embodied cognition */*)
- 19:43, 10 February 2022 (diff | hist) . . (-3) . . Embodied cognition (*delete unnecessary space*)
- 18:55, 10 February 2022 (diff | hist) . . (+53) . . Embodied cognition (*Added two images to the Template:Infobox*)
- 18:48, 10 February 2022 (diff | hist) . . (+197) . . Embodied cognition (*Filled the RelatedFields parameter in the Template:Infobox*)
- 18:39, 10 February 2022 (diff | hist) . . (+673) . . Embodied cognition (*Filled Origin and CognitiveFeatures parameters in the Template:Infobox*)
- 18:26, 10 February 2022 (diff | hist) . . (+185) . . Embodied cognition (*Filled the TheoryOf and KeyConcepts parameters in the Template:Infobox*)
- 18:23, 10 February 2022 (diff | hist) . . (+48) . . Embodied cognition (*Created an Infobox using the Template:Infobox Theory*)
- 10:02, 03 February 2022 (diff | hist) . . (+30) . . Embodied cognition (*/*Sensorimotor contingencies*/ Text edit to improve legibility*)
- 18:53, 02 February 2022 (diff | hist) . . (-4) . . **m** Embodied cognition (*/* Perception */*)
- 20:13, 01 February 2022 (diff | hist) . . (-55) . . Embodied cognition (*/* Emotion */ minor reference edit*)
- 15:35, 30 January 2022 (diff | hist) . . (+580) . . Embodied cognition (*/*Embodiment thesis */ Added two images on models of cognition and the respective text.*)
- 13:44, 30 January 2022 (diff | hist) . . (+906) . . Embodied cognition (*/* The scope of embodied cognition */ Reference editing and text editing on the neuroscience paragraphs.*)
- 14:51, 28 January 2022 (diff | hist) . . (-295) . . Embodied cognition (*deleted weirdly placed reference.*)
- 19:14, 25 January 2022 (diff | hist) . . (-813) . . **m** Embodied cognition
- 18:42, 25 January 2022 (diff | hist) . . (-43) . . **m** Embodied cognition (*/* Embodiment thesis */ minor reference edit*)
- 18:25, 25 January 2022 (diff | hist) . . (-13) . . **m** Embodied cognition
- 17:56, 25 January 2022 (diff | hist) . . (+295) . . Embodied cognition (*/* Perception */*)
- 17:43, 25 January 2022 (diff | hist) . . (+43) . . Embodied cognition (*/* Embodiment thesis */ reference edit and link to the entrances on the different types of memories.*)
- 17:24, 25 January 2022 (diff | hist) . . (+194) . . Embodied cognition (*/* Embodiment thesis */ Editing and adding information on "the six views of embodied cognition".*)
- 22:27, 19 January 2022 (diff | hist) . . (-5,461) . . Embodied cognition (*/* Six views of embodied cognition */ Section has been edited and moved up to "the embodiment thesis".*)
- 22:12, 19 January 2022 (diff | hist) . . (-246) . . Embodied cognition (*/* The scope of embodied cognition */ edited paragraph on categories. unnecessary sentence and repeated ones were deleted.*)
- 19:15, 19 January 2022 (diff | hist) . . (-120) . . **m** Embodied cognition (*/* The scope of embodied cognition */ Reference editing minor edit*)
- 01:01, 19 January 2022 (diff | hist) . . (+261) . . Embodied cognition (*/* History */ Reference editing, section completed*)
- 00:50, 19 January 2022 (diff | hist) . . (-201) . . Embodied cognition (*/* History */ Referenced already existing reference and edited some sentences for better clarity.*)

- 00:37, 19 January 2022 (diff | hist) . . (+115) . . Embodied cognition /* History */ Reference editing minor edits)
 - 00:08, 19 January 2022 (diff | hist) . . (+882) . . m Embodied cognition /* History */ reference editing.)
 - 23:27, 18 January 2022 (diff | hist) . . (-45) . . m Embodied cognition /* Embodiment thesis */ minor reference edit)
 - 23:02, 18 January 2022 (diff | hist) . . (+64) . . Embodied cognition /* Embodiment thesis */ small reference edit to comma-separated authors)
 - 22:37, 18 January 2022 (diff | hist) . . (+753) . . Embodied cognition /* History */ Edited reference to pragmatism and added content on Dewey's work.)
 - 21:26, 18 January 2022 (diff | hist) . . (-584) . . Embodied cognition /* History */ Reference editing.)
 - 20:39, 18 January 2022 (diff | hist) . . (+261) . . Embodied cognition /* History */ Reference editing)
 - 19:16, 17 January 2022 (diff | hist) . . (+116) . . Embodied cognition /* Embodiment thesis */ Reference editing and added content regarding what it means for cognition to be situated.)
 - 18:39, 17 January 2022 (diff | hist) . . (+346) . . Embodied cognition /* Embodiment thesis */ Reference editing, 1st par.)
 - 21:26, 06 January 2022 (diff | hist) . . (+77) . . Embodied cognition /* The scope of embodied cognition */ re-wrote sentence on cognitive science. The previous one was not understandable.)
 - 01:21, 06 January 2022 (diff | hist) . . (-3,741) . . Embodied cognition /* Philosophical background */ the philosophical background section has been deleted. The ideas contained were covered in other sections (history section).)
 - 20:54, 05 January 2022 (diff | hist) . . (+422) . . Embodied cognition /* Emotion */ added an image .gif I created explaining the approach and avoidance task.)
 - 09:49, 09 December 2021 (diff | hist) . . (+7) . . Embodied cognition (Undid revision 1059412370 by [[Special:Contributions/YejKim1003|YejKim1003]] ([[User talk:YejKim1003|talk]])
 - 01:38, 09 December 2021 (diff | hist) . . (+1,176) . . Embodied cognition /* Emotion */ Added a recent study to complement the paragraph on the AAT)
 - 23:29, 08 December 2021 (diff | hist) . . (-7) . . Embodied cognition /* Emotion */ edited some quotation marks and linked the mirror neuron wiki entrance.)
 - 21:46, 08 December 2021 (diff | hist) . . (-144) . . Embodied cognition /* Evolutionary view */ Edited the section content and added it to the "Emotion" section to complement the idea on embodiment of abstract words.)
 - 21:30, 08 December 2021 (diff | hist) . . (-1) . . Embodied cognition /* The scope of embodied cognition */ moved a paragraph regarding AI for better fitting the section's content.)
 - 21:11, 08 December 2021 (diff | hist) . . (+197) . . Embodied cognition /* The scope of embodied cognition */ Added two hidden comments about AI and robotics header deletion and placed section content inside section 4.)
 - 13:31, 08 December 2021 (diff | hist) . . (+106) . . Embodied cognition /* Neuroscience */ Added two hidden comments about neuroscience header deletion and placed section content inside section 4.)
 - 12:21, 08 December 2021 (diff | hist) . . (-52) . . Embodied cognition /* The scope of embodied cognition */ Edited the section regarding "prototypes" to make the content fit this section.)
 - 00:08, 08 December 2021 (diff | hist) . . (+25) . . Embodied cognition /* The scope of embodied cognition */ Image schema subheader was deleted and content edited to fit this section.)
 - 23:50, 07 December 2021 (diff | hist) . . (-12) . . Embodied cognition /* The scope of embodied cognition */ edited the first part concerning the conceptual metaphor to make it fit this section.)
 - 22:57, 07 December 2021 (diff | hist) . . (+1,269) . . Embodied cognition /* The scope of embodied cognition */ added a connecting paragraph regarding the sciences and the domains of cognition.)
 - 21:52, 07 December 2021 (diff | hist) . . (+310) . . Embodied cognition /* Cognitive science and linguistics */ Added two hidden comments about cognitive science and linguistics header deletion and placed section content inside section 4.)
 - 00:13, 07 December 2021 (diff | hist) . . (+224) . . Embodied cognition /* Cognitive psychology */ The header for this section has been removed. See page's Talk section.)
 - 23:50, 06 December 2021 (diff | hist) . . (+12) . . m Embodied cognition /* Emotion */ minor connector edit)
 - 23:42, 06 December 2021 (diff | hist) . . (+1,986) . . Embodied cognition /* Emotion */ complementing the AA)
 - 21:03, 06 December 2021 (diff | hist) . . (+43) . . Embodied cognition /* Emotion */)
 - 17:38, 23 November 2021 (diff | hist) . . (+883) . . Embodied cognition /* Perception */ edit first paragraph for better readability, added more information and references.)
 - 12:45, 08 November 2021 (diff | hist) . . (+324) . . Embodied cognition /* Perception */ added missing references.)
 - 22:58, 02 November 2021 (diff | hist) . . (+583) . . Embodied cognition /* Cognitive psychology */ Hidden comment about incoming structural changes.)
 - 22:42, 02 November 2021 (diff | hist) . . (+320) . . Embodied cognition /* Philosophical background */ Hidden comment about sections nomination for deletion.)
 - 15:17, 26 October 2021 (diff | hist) . . (+893) . . Embodied cognition /* History */ I added content on 4E cognition to the closing remarks of the last paragraph.)
 - 22:39, 21 October 2021 (diff | hist) . . (+2,745) . . Embodied cognition /* History */ Added a new paragraph regarding the role of connectionism in the history of EC.)
 - 09:26, 21 October 2021 (diff | hist) . . (+34) . . m Embodied cognition /* Language */ minor edits concerning the mirror neurons paragraph.)
 - 22:16, 20 October 2021 (diff | hist) . . (+459) . . Embodied cognition /* Embodiment thesis */ Added some sentences expanding and complementing Enactivism.)

- 10:14, 19 October 2021 (diff | hist) . . (+24) . . Embodied cognition (*The idea that those aspects are beyond the brain itself emphasizes the environmental aspects as well as the idea that not only studying the brain suffices for an explanation of cognition*)
- 16:34, 10 October 2021 (diff | hist) . . (+120) . . m Embodied cognition (*/* Learning */ minor grammar edits*)
- 15:16, 08 October 2021 (diff | hist) . . (+1,226) . . Embodied cognition (*/* History */ I added a paragraph regarding O'Regan and Nöe SMCs theory and its contribution to the history of EC.*)
- 15:05, 08 October 2021 (diff | hist) . . (+30) . . Embodied cognition (*/* History */ updated some missing reference links.*)
- 15:02, 08 October 2021 (diff | hist) . . (+938) . . Embodied cognition (*/* History */ I added a paragraph about J.J Gibson ecological psychology's influence in the history of EC.*)
- 14:53, 08 October 2021 (diff | hist) . . (+1,115) . . Embodied cognition (*/* History */ I added a new transitional paragraph to introduce EC history after late 20th century*)
- 23:03, 06 October 2021 (diff | hist) . . (+353) . . Embodied cognition (*/* History */ Added an image timeline reconstructing key developments in the history of embodied cognition.*)
- 19:18, 06 October 2021 (diff | hist) . . (+188) . . Embodied cognition (*I added an image regarding the scope of embodied cognition.*)
- 12:37, 22 July 2021 (diff | hist) . . (+6,800) . . Embodied cognition (*Added a new section on the "History" of embodied cognition. Additionally, I inserted hidden comments stating it is still under construction.*)
- 13:15, 09 July 2021 (diff | hist) . . (+221) . . Embodied cognition (*minor edits in the Memory section.*)
- 12:28, 09 July 2021 (diff | hist) . . (-55) . . Embodied cognition (*/* Memory */ minor edits to the memory section*)
- 00:21, 08 July 2021 (diff | hist) . . (-1,330) . . Embodied cognition (*The two images from the studies that already existed here will be introduced accordingly later on.*)
- 18:56, 07 July 2021 (diff | hist) . . (+115) . . Embodied cognition (*hidden comment to the "Perspective" sub-heading explaining what will happen with it.*)
- 18:11, 07 July 2021 (diff | hist) . . (+246) . . Embodied cognition (*Header "Connections with the sciences" changed for "The scope of embodied cognition". Also added new introduction paragraph for this section.*)
- 16:02, 07 July 2021 (diff | hist) . . (-14) . . Embodied cognition (*Reasoning section was placed under "Cognitive psychology" section.*)
- 15:54, 07 July 2021 (diff | hist) . . (+153) . . Embodied cognition (*created a new header1 "Perception" under the 'Cognitive psychology' section which will include a re-written version of the current 'Visual search', 'Distance perception' and, 'Perspective'.*)
- 17:15, 06 July 2021 (diff | hist) . . (-1) . . Embodied cognition (*changed the Social psychology header for Social cognition*)
- 17:11, 06 July 2021 (diff | hist) . . (+1,369) . . Embodied cognition (*new paragraph contrasting previous neuroscience idea of cognition with neuroscience more recent take on embodiment.*)
- 16:52, 06 July 2021 (diff | hist) . . (+10) . . Embodied cognition (*Psychology header changed for a more appropriate one "Cognitive Psychology".*)
- 16:46, 07 June 2021 (diff | hist) . . (+2) . . m Embodied cognition (*/* Embodiment thesis */*)
- 16:43, 07 June 2021 (diff | hist) . . (+972) . . Embodied cognition (*Added two paragraphs at the end of the embodied cognition section introducing the "narrower" characterization of embodiment. Also, deleted mention to Dawson since source is unclear and does not appear on the entrance's references (see hidden comment).*)
- 15:16, 07 June 2021 (diff | hist) . . (+735) . . Embodied cognition (*further commenting on Varela's citation in the embodiment thesis section.*)
- 23:10, 06 June 2021 (diff | hist) . . (+1,336) . . Embodied cognition (*emphasized the role of the body in the embodiment thesis and added some references.*)

Next 500 results →

Appendix E
Page's Structural Changes

Embodied cognition page: structure proposal

EC Wikipedia page structural change part II

After we had reached a considerable amount of work on both the individual sections and subsections, we decided some more structural changes were needed. Indeed, section 5: "Cognitive psychology", was getting most of the attention since most of the cognitive capacities were listed inside it. This was unfair to the other sciences and problematic since all cognitive capabilities as studied from an embodied perspective across different disciplines, and most advances done have resulted from joined efforts between them. I created the Trello card that would allow us to keep track of all tasks needed to accomplish this second structural change successfully. Additionally, other editors were informed about it in advance. By informing other members of the changes coming, we ensured avoiding conflicts with other possible editors working on the EC Wikipedia entrance. This was achieved by taking advantage of two essential Wikipedia tools. First, hidden comments were placed on those places on the page where changes would be made. These comments are not visible to readers of the page and only available under editor mode. Second, a public talk was started under the "Talk" section of the page so that there was a more visible and accessible way for others to get informed. For clarification purposes, an image of the proposal that appears below was uploaded to the talk section. (See images on hidden comments and Talk comment)

Hidden comment 1:

- **Title:** Hidden comment about incoming structural changes.
- **Message:**
- --- Structural changes: --- - The sub-headers contained under this section will eventually be moved and each will become a main header.
 - The sciences (cognitive psychology, AI, Cognitive science, Neuroscience, etc) will be mentioned in paragraphs inside "The scope of embodied cognition" section. The reason for this is that there is an unfair and inaccurate distribution of the cognitive capacities as being mostly studied by cognitive psychology. For more information, refer to the "Talk" section where this is also being announced and discussed. Any ideas are welcome!

Hidden comment 2:

- **Title:** Section nominated for deletion.
- **Message:**
- --- Section nominated for DELETION. --- Most of the ideas here contained were already considered in other sections. Thus, the content here es repetitive. The ideas on Kant are not entirely connected to the embodiment thesis as we know it and as the "Talk" section of the entrance shows, it is rather problematic.

New section in the talk section:

- **Title:** Restructure page's content table.
- **Message:**

Under the page's current state, there is an imbalance regarding the distribution of the cognitive capacities content. Namely, most of them are listed under section 5 "Cognitive psychology". This is both unfair to the other sciences and problematic since all those topics (subsections 5.1 to 5.9) are investigated across all sciences. The changes include but are not limited to:

1. Edit section 4 and add some paragraphs that will contain information about the different sciences and emphasize the interdisciplinary approach to investigate cognition from an embodied perspective. Thus, the headers containing the different sciences will no longer exist as separate headers but rather they will be contained as individual paragraphs inside section 4.
2. Then, subsections 5.1 to 5.9 and 7.1 (along with any other relevant topics that appear) will constitute each its own header and listed after section 5 (option 1), or we create a separate header (e.g., "Cognitive and bodily features/aspects") and list the subsections under it. I consider option 2 more appropriate but open to hear ideas.

For more information, check the hidden comments in the "Cognitive psychology" section.

Restructure II: Embodied Cognition Table of Content

Option 1

1. Embodiment thesis
2. Philosophical background
(Section nominated for deletion. Its content has been mentioned in sections 2 and 4. For more information, see the hidden comment in that section).
3. History
4. The scope of embodied cognition
(Here, new paragraphs will mention the sciences).
5. Perception
6. Language
7. Memory
8. Learning
9. Reasoning
10. Emotion
11. Self-regulation
12. Social cognition
13. Evolutionary view
(Section under revision)
14. Sensorimotor contingencies
15. Criticisms
(Section under revision. It will probably contain "Challenges" regarding EC theory.)
16. Six views of embodied cognition
(Section under revision. It looks like a summary of an article, and some topics were already previously mentioned)

Option 2

1. Embodiment thesis
2. Philosophical background
(Section nominated for deletion. Its content has been mentioned in sections 2 and 4. For more information, see the hidden comment in that section).
3. History
4. The scope of embodied cognition
(Here, new paragraphs will mention the sciences).
5. Cognitive and bodily features/aspects (?)
 - 5.1. Perception
 - 5.2. Language
 - 5.3. Memory
 - 5.4. Learning
 - 5.5. Reasoning
 - 5.6. Emotion
 - 5.7. Self-regulation
 - 5.8. Social cognition
 - 5.9. Evolutionary view
(Section under revision. It does not fit here)
- 5.10. Sensorimotor contingencies
6. Criticisms
(Section under revision. It will probably contain "Challenges" regarding EC theory.)
7. Six views of embodied cognition
(Section under revision. It looks like a summary of an article, and some topics were already previously mentioned)

Embodied Cognition Table of Content Updated

Final version

During peer-review, title names had to be shortened and modified to follow a more encyclopedic style.

Contents

1. Theory
2. History
3. Scope
 - 3.1. Perception
 - 3.2. Language
 - 3.3. Memory
 - 3.4. Learning
 - 3.5. Reasoning
 - 3.6. Emotion
 - 3.7. Self-regulation
 - 3.8. Social cognition
 - 3.9. Sensorimotor contingencies
4. Applications
 - 4.1. Education
 - 4.2. AI and robotics
 - 4.3. Clinical settings
 - 4.4. Sport
 - 4.5. Music
 - 4.6. Social psychology
5. Controversy
 - 5.1. Research with preverbal infants
 - 5.2. Replication crisis and misinterpretation

Additional hidden comments for structural changes

So far, we have waited for around 3-4 weeks since the proposal was made public on the page's "Talk" section, and there was no feedback. Then, I proceed to start with the structural changes as proposed above.

1. Remove the "Cognitive psychology" section and place the corresponding subheaders inside "The scope of embodied cognition"

Hidden comment 1:

- **Title:** Hidden comment about incoming structural changes.
- **Message:**
- --UPDATE:-- As discussed in the page's "Talk" section, the "Cognitive psychology" section has been removed and the respective subheaders (perception, reasoning, memory, etc.) has been moved inside "The scope of embodied cognition" section.

Edit summary:

- /* Cognitive psychology*/ The header for this section has been removed. See page's Talk section.
- 2. Remove the headers regarding the sciences and bring the respective content under "The scope of embodied cognition" (section 4)

Hidden comment 2:

- **Title:** Added two hidden comments about cognitive science and linguistics header deletion and placed section content inside section 4.
- **Message:**
- --Structural change:-- The "cognitive science and linguistics" header has been deleted. Its content has been adapted and placed inside "the scope of embodied cognition" section 4 (See the "Talk" section of this entrance).

Hidden comment 3:

- **Title:** Added two hidden comments about cognitive science and linguistics header deletion and placed section content inside section 4.
- **Message:**
- --Content insertion--- This content was previously under the section titled "cognitive science and linguistics" which was deleted. The content will be edited to fit this section accordingly. (See "Talk" section of this entrance.

Hidden comment 4:

- **Title:** Added two hidden comments about neuroscience header deletion and placed section content inside section 4.
- **Message:**
- --Structural change 2:-- The "Neuroscience" header has been deleted. Its content has been adapted and placed inside "the scope of embodied cognition" section 4 (See the "Talk" section of this entrance.

Hidden comment 4:

- **Title:** Added two hidden comments about neuroscience header deletion and placed section content inside section 4.
- **Message:**
- --Structural change 2:-- Here starts the content from the "neuroscience" section that was deleted. Edits will be done accordingly.

Hidden comment 5:

- **Title:** Added two hidden comments about AI and robotics header deletion and placed section content inside section 4.
- **Message:**
- --Structural change 3:-- The "AI and robotics" header has been deleted. Its content has been adapted and placed inside "the scope of embodied cognition" section 4 (See the "Talk" section of this entrance.

Hidden comment 6:

- **Title:** Added two hidden comments about AI and robotics header deletion and placed section content inside section 4.
- **Message:**
- --Structural change 3:-- Here starts the content from the "AI and robotics" section that was deleted. Edits will be done accordingly.

Appendix F
Complementary Images

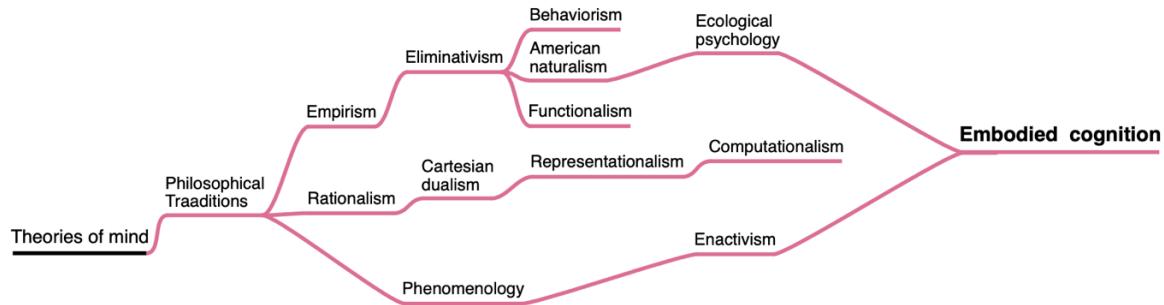
Complementary Figure A

Humanoid in a Virtual Reality Environment



Note: This is a humanoid prototype created using Blender (2018), a free open-source 3D modeling computer graphics software. It was meant to help reproduce scenes in a virtual environment using Unity 3D engine. Unfortunately, it was left unfinished due to time constraints and work overload.

Complementary Figure B

Mind Map Alternative for The History Timeline

Note: An initial sketch for the history timeline was created online using GoJS.net. The structure was unsuitable for the amount of content inside in the history and the idea was abandoned halfway through. The code is provided below.

Empowered by GoJS.net

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{
  "class": "TreeModel",
  "nodedataArray": [
    {"key":0,"text":"Theories of mind","loc":"35 -38"},

    {"key":3,"parent":0,"text":"Philosophical \nTraaditions","brush":"palevioletred","dir":"right","loc":"154 -61.75"},

    {"key":31,"parent":3,"text":"Empirism","brush":"palevioletred","dir":"right","loc":"244.603515625 -124.32783203125"},

    {"key":32,"parent":3,"text":"Rationalism","brush":"palevioletred","dir":"right","loc":"265.603515625 -54.75"},

    {"key":33,"parent":3,"text":"Phenomenology","brush":"palevioletred","dir":"right","loc":"275.603515625 7.827832031250011"},

    {"key":311,"parent":31,"text":"Eliminativism","brush":"palevioletred","dir":"right","loc":"320.76806640625 -166.32783203125"},

    {"text":"Cartesian \ndualism","brush":"palevioletred","dir":"right","parent":32,"key":-8,"loc":"353.51708984375 -72.75"},

    {"text":"Enactivism","brush":"palevioletred","dir":"right","parent":33,"key":-9,"loc":"438.5615234375 51.82783203125001"},

    {"text":"Behaviorism","brush":"palevioletred","dir":"right","parent":331,"key":-10,"loc":"416.60986328125 -198.9056640625"},

    {"text":"American\nnaturalism","brush":"palevioletred","dir":"right","parent":331,"key":-11,"loc":"416.60986328125 -166.32783203124998"},

    {"text":"Functionalism","brush":"palevioletred","dir":"right","parent":331,"key":-12,"loc":"415.60986328125 -124.74999999999999"},

    {"text":"Ecological \npsychology","brush":"palevioletred","dir":"right","parent":-11,"key":-13,"loc":"544.576171875 -187.32783203124998"},

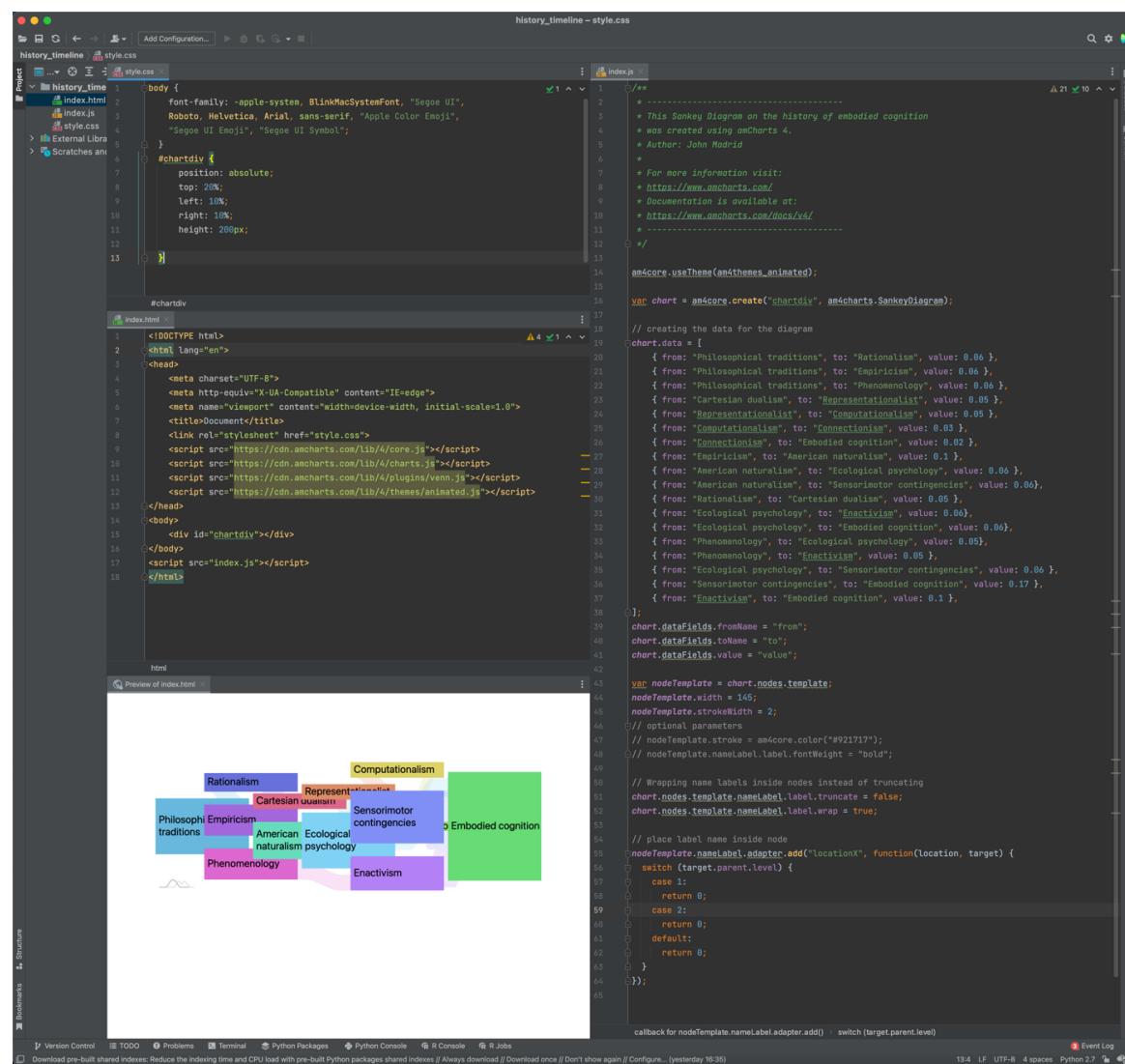
    {"text":"Embodyed cognition","brush":"palevioletred","dir":"right","parent":-13,"key":-14,"loc":"747.6142578125 -106.32783203124998"},

    {"text":"","brush":"palevioletred","dir":"right","parent":-9,"key":-15,"loc":"748.40966796875 -96.17216796874999"},

    {"text":"Representationalism","brush":"palevioletred","dir":"right","parent":-8,"key":-16,"loc":"437.154296875 -82.75"},

    {"text":"Computationalism","brush":"palevioletred","dir":"right","parent":-16,"key":-17,"loc":"574.65869140625 -94.75"}
  ]
}
```

Complementary Figure C

Sankey Diagram Alternative for the History Timeline

Note:

Another alternative prototype image for the history timeline. It was created using JavaScript empowered by amCharts 4 and it is HTML based. The code for the creation is as specified above.

Figure F1

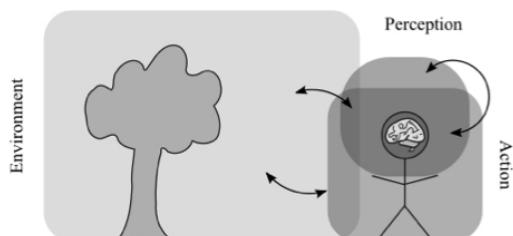
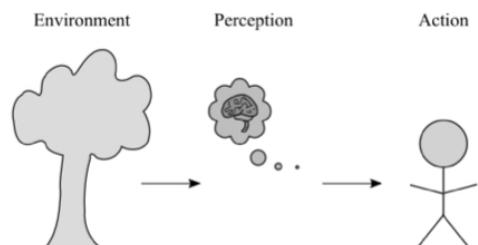
Change Blindness Alternative



Note. Change blindness alternative created using Keynotes. Here the overlapping images are put side by side, but in the actual GIF format, images alternate so that one image is shown after another.

Figure F2

Images Reused from Wikimedia Commons

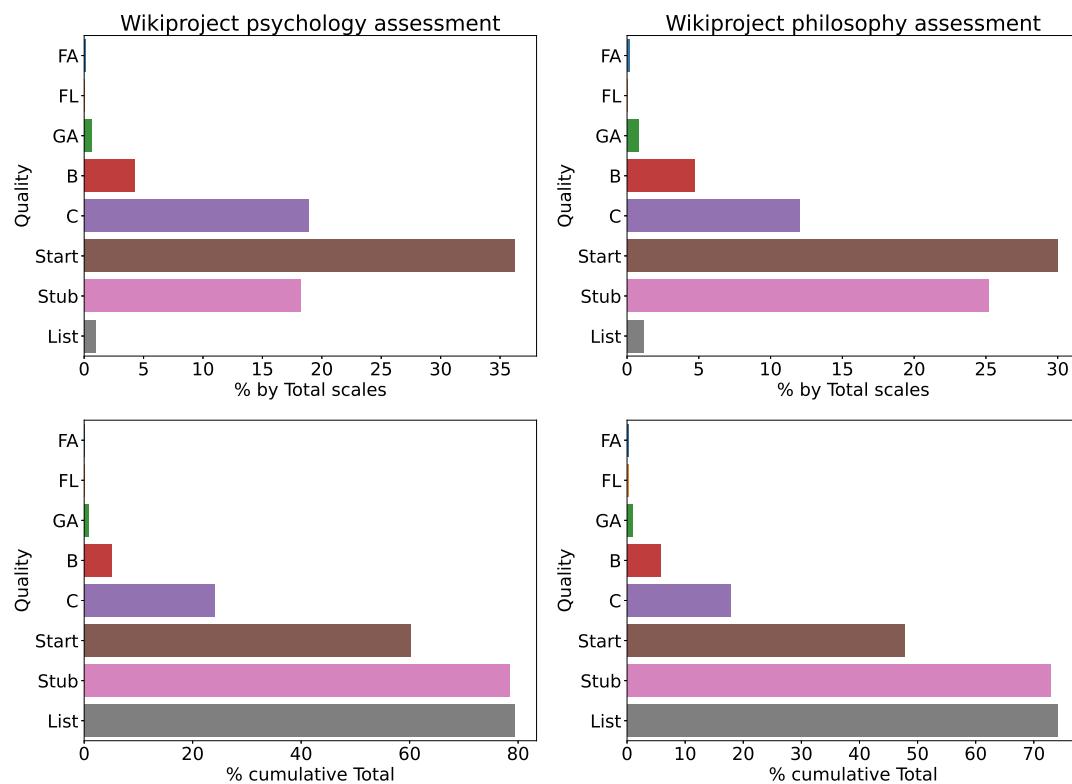
*Human (male)**The Phantom Limb Illusion**Dynamic Embodied Model**Classical Cartesian Model**Atlas the Robot connecting a Hose to a Pipe**Atlas the Robot climbing into a Vehicle*

Note. Set of images used in the *Embodied Cognition* Article. From Wikimedia

Commons <https://commons.wikimedia.org/wiki/Category:Psychology>

Figure F3

Psychology and Philosophy Quality Scale Total Articles



Note. The percentage and cumulative percentage of all articles belonging to the psychology and philosophy wikiprojects. The image was created in PyCharm using data from Wikipedia's wikiprojects assessment page available at https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Psychology/AssessmentImportance_scale

Appendix G
Article's Accepted Abstract

Abstract prepared for the
10TH BUDAPEST VISUAL LEARNING CONFERENCE
– FACING THE FUTURE, FACING THE SCREEN
to be held simultaneously online and physically on Nov. 17, 2022, 13:00–19:00 CET,
organized by the Committee for Communication and Media Theory
of the Hungarian Academy of Sciences and by Corvinus University of Budapest.

John Jairo Madrid-Carvajal

**Embodied Cognition on Wikipedia:
Making Open-Access Quality Research
Available Online**

Over the past years, with the internet's advent, scholars have progressively moved toward online-based resources when doing research. The COVID-19 pandemic challenged us all and made online content more pressing than ever. Journals, magazines, and newspapers now offer online content for everyone to access and document their research. However, reliable scientific content available often costs, and subscriptions can become unaffordable for many students, academics, and people worldwide. Additionally, standard journals' format lacks dynamism; they often offer readers a (limited) number of single papers. In contrast, Wikipedia's online free-content policy facilitates equal access to information for everyone through encyclopedic articles that provide an overview of a particular topic based on multiple resources.

Wikipedia has become a widely and commonly used online free-content encyclopedia; its pedagogical advantages and the visibility of its articles are undeniable. Wikipedia's content has exponentially grown and is considered “the largest and most-read reference work in history”. Its exponential growth highlights the significance of its open-access editorial policy as explained by Almeida et al. in 2007. However, due to its collaborative nature, Wikipedia's articles are susceptible to misinformation, incompleteness, and even vandalism. Anyone with internet connection can create, edit, and manipu-

late Wikipedia's content. Thus, both the quality and reliability of Wikipedia's articles vary significantly from one another and the same article over time.

One such low-quality and unreliable Wikipedia entry concerns the “embodied cognition” (EC) article. As an interdisciplinary theory, EC reaches readers across multiple disciplines such as cognitive science, psychology, neuroscience, artificial intelligence, linguists, and philosophy. However, despite both the gained popularity of EC theory across the sciences and the relevance of Wikipedia as a widely used source of information, little is done to improve the quality of the EC article’s content on Wikipedia. In the spirit of Wikipedia’s online free-content policy, here we undertook a collaborative effort to write, update, and improve the EC article’s online content. The editing actions performed materialize in a well-informed and well-written encyclopedic article that will benefit future researchers, as well as in an increase in the EC page’s views.

John Jairo Madrid-Carvajal is an MSc student in cognitive science at the University of Osnabrück (Germany). He holds a BA in philosophy with a major in philosophy of mind at the University of Antioquia (Colombia). His research interests are in the intersection between human cognition, philosophy, neuroscience, and artificial intelligence. Currently, he is a member of the Neurobiopsychology research group at the cognitive science institute where he is writing his master thesis on face perception in humans under the supervision of Prof. Dr. Peter König. E-mail: jmadridcarva@uni-osnabrueck.de.