It takes time to be confident: Implications of treating confidence as the result of an evidence accumulation process.

A Data Management Plan created using DMPonline.be

Creators: Luc Vermeylen, Kobe Desender

Affiliation: KU Leuven (KUL)

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Principal Investigator: Kobe Desender

Data Manager: Luc Vermeylen

Project Administrator: Luc Vermeylen

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Project abstract:

When making decisions in the absence of feedback, it is crucial to have good estimates of confidence in these decisions (high metacognitive accuracy) as this allows to effectively adapt behavior. State-of-the-art models of metacognitive accuracy typically ignore decision speed as they rely on static signal detection theory. Yet, key to understanding the computations underlying decision making is the speed at which decisions are taken, which is well-explained by dynamic evidence accumulation models. I showed that static frameworks confound metacognitive accuracy with response caution and developed a novel dynamic model of metacognitive accuracy as a solution (v-ratio). In this framework, confidence is quantified as post-decisional evidence accumulation, and metacognitive accuracy is not confounded with response caution. I propose to investigate three key implications of the v-ratio model. First, I will reinvestigate the finding that metacognition is domain-general (important for building interventions aiming to correct metacognitive biases), as current evidence is based on the confounded static frameworks. Second, from a dynamic perspective it follows that confidence judgements should be under the influence of strategic control (just like decisions) - a novel question and potential important confound yet to be accounted for. Third, my model allows us to provide a first direct model-based link between post-decisional evidence accumulation (confidence) and components in the EEG.

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DPIA

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Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

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GDPR

GDPR

Have you registered personal data processing activities for this project?

- Not applicable

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Application DMP

Questionnaire

Describe the datatypes (surveys, sequences, manuscripts, objects …) the research will collect and/or generate and /or (re)use. (use up to 700 characters)

In WP1, I will reanalyze existing data (e.g., from the Confidence Database, Rahnev et al., 2020).

In WP2, I will collect behavioral data saved in .csv files which are generated using computerized experiments. I will collect behavioral data of healthy adult individuals. In a series of computerized laboratory tasks, subjects will make decisions about perceptual stimuli while indicating their confidence in their decisions. Apart from these variables (choices, decision time and confidence judgements) and specific demographics (age, gender, handedness), no further information will be collected.
In WP3 I will collect behavioral (.csv files) and neurophysiological data (.bdf files). All data is fully psuedonymized. This means that only the post-doctoral candidate will have the encryption key that links participants with their identifier. No personal or sensitive data will be collected (only gender, age and handedness). All other identifiers will be removed.
In keeping with KUL practice, I will apply for ethical approval of each study prior to data collection.

Specify in which way the following provisions are in place in order to preserve the data during and at least 5 years after the end of the research? Motivate your answer. (use up to 700 characters)

1. Designation of responsible person (If already designated, please fill in his/her name.)
2. Storage capacity/repository
    - during the research
    - after the research

1. I (Luc Vermeylen) will be responsible for preserving the data up to at least 5 years after the research.
2. All data will be saved on the KUL OneDrive (encrypted and password protected), which is automatically backed-up. In addition, after publication of a manuscript, the data will be published on an open repository (e.g., osf.io) allowing reuse by other researchers. Importantly, when signing the informed consent participants will have to agree that their (psuedonymized) data can be shared openly.

What's the reason why you wish to deviate from the principle of preservation of data and of the minimum preservation term of 5 years? (max. 700 characters)

/

Are there issues concerning research data indicated in the ethics questionnaire of this application form? Which specific security measures do those data require? (use up to 700 characters)

/

Which other issues related to the data management are relevant to mention? (use up to 700 characters)

/

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FWO DMP (Flemish Standard DMP)

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1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
		Please choose from the following options: • Generate new data • Reuse existing data	*Please choose from the following options:* • Digital • Physical	*Please choose from the following options:* • Observational • Experimental • Compiled/aggregated data • Simulation data • Software • Other • NA	*Please choose from the following options:* • .por, .xml, .tab, .csv,.pdf, .txt, .rtf, .dwg, .gml, … • NA	*Please choose from the following options:* • <100MB • <1GB • <100GB • <1TB • <5TB • <10TB • <50TB • >50TB • NA	
WP1.2	Is there domain-general metacognition? Whereas previous work has found evidence for domain-general ability using signal detection measures, we have shown that these measures are confounded with response caution8. Importantly, humans tend to set similar levels of response caution for different tasks20. Therefore, it is not clear whether the state-of-the-art is measuring domain-general metacognition, or instead just domain-general response caution	Reuse existing data	Digital	Experimental	.csv	<1GB	

WP2	In WP2, I will examine the hypothesis that second-order confidence can be treated like a first-order decision, and therefore is also under strategic control (with regards to speed and accuracy). To this end, I will extend the v-ratio model to include a second-order confidence response boundary as described above (Fig. 3-4). Experimentally, I will examine the influence of biasing either speed or accuracy of confidence reports on behavior and on the confidence reports.	Generate new data	Digital	Experimental	.csv	<1GB	
WP3	I will use the experimental design of WP2 and adapt it for an EEG study. Using a decoding approach, I will extract single-trial estimates of the Pe component (thought to reflect post-decisional evidence accumulation) and single-trial estimates of the CPP component (thought to reflect the pre-decision evidence accumulation process). When fitting our hierarchical version of the extended v-ratio model to these data, I will allow the pre-decisional drift rate to vary as a function of single-trial CPP estimates, and the post-decisional drift rate to vary as a function of single-trial Pe estimates (i.e., our main model of interest).	Generate new data	Digital	Experimental	.csv (behavioral data) and .bdf (eeg data)	<1TB	
Analysis scripts	Scripts to analyse the data	Generate new data	Digital	Other	.R	< 100 MB	

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

Rahnev, D., Desender, K., Lee, A.L.F. et al. The Confidence Database. Nat Hum Behav 4, 317–325 (2020). https://doi.org/10.1038/s41562-019-0813-1

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- Yes, human subject data

In all of my studies, participants will be asked to indicate age, handedness and gender. When publishing or presenting results, I will never present individual responses to these questions, but only mean/standard deviation of age, and the frequencies of each gender category and handedness. Importantly, upon making the data available online (osf), I will make the data fully anonymised by permanently removing these three variables from the data.
Furthermore, I never ask for participant's names, email-adresses, etc.

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

2. Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).

All files and documents related to a single project will be stored in meaningfully named folders and subfolders, following a logical structure. The same folder structure will be followed throughout different projects. At the level of the main folder, a README.txt file will be included. Within datafiles throughout different projects, variables will be given consistent and self-explanatory names where possible. For the EEG data,

I will implement the Brain Imaging Data Structure (BIDS) standard. This will disclose important parameters of the data that are necessary to understand and analyze the data.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- Yes

BIDS will be used for neuroimaging data. It is a standard for organizing and describing MRI datasets. The BIDS standard uses file formats compatible with existing software, unifies the majority of practices already common in the field, and captures the metadata necessary for most common data processing operations (Gorgolewski, Auer, Calhoun, V. et al.). This facilitates data sharing with other researchers.

3. Data storage & back-up during the research project

Where will the data be stored?

All data will be saved on KU Leuven's OneDrive. In addition, after publication of a manuscript, the data will be published on an open repository (e.g., osf.io) allowing reuse by other researchers. Importantly, when signing the informed consent participants will have to agree that their (anonymized) data can be shared openly.

How will the data be backed up?

All data will be saved on KU Leuven's OneDrive, which is automatically backed up.

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely.
If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.

- Yes

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

All data will be saved on KU Leuven's OneDrive, which is encrypted and password protected.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

None

4. Data preservation after the end of the research project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

All data will be preserved for 10 years.

Where will these data be archived (stored and curated for the long-term)?

In addition to the KU Leuven's onedrive, the data will be saved locally on an encrypted hard-disk. In addition, after publication of a manuscript, the data will be published on an open repository (e.g., osf.io) allowing reuse by other researchers. Importantly, when signing the informed consent participants wil have to agree that their (anonymized) data can be shared openly.

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

None

5. Data sharing and reuse

Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.

- Yes, in an Open Access repository

For all planned studies, all data will be made available in an open access repository such as OSF.

If access is restricted, please specify who will be able to access the data and under what conditions.

NA

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.

- No

Where will the data be made available? If already known, please provide a repository per dataset or data type.

open science framework: osf.io - for all projecs.

When will the data be made available?

Upon publication of the research results.

Which data usage licenses are you going to provide? If none, please explain why.

CC-BY-NC-ND-4.0

Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.

- Yes

DOI

What are the expected costs for data sharing? How will these costs be covered?

None

6. Responsibilities

Who will manage data documentation and metadata during the research project?

I (Luc Vermeylen). Upon leaving the department, this responsibility will be handed over to Kobe Desender (PI).

Who will manage data storage and backup during the research project?

I (Luc Vermeylen). Upon leaving the department, this responsibility will be handed over to Kobe Desender (PI).

Who will manage data preservation and sharing?

I (Luc Vermeylen). Upon leaving the department, this responsibility will be handed over to Kobe Desender (PI).

Who will update and implement this DMP?

I (Luc Vermeylen)