RETHINKING 'THINKING ABOUT YOUR THINKING': IDENTIFYING THE ROLE OF METACOGNITIVE MONITORING IN ACADEMIC LEARNING THROUGH COGNITIVE PSYCHOLOGY METHODS IN EDUCATIONAL RESEARCH

A Data Management Plan created using DMPonline.be

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Project abstract:

Identifying the origin and correlates of individual differences in academic learning is a critical goal of educational sciences. This is because educational research aims to develop learning environments that are optimally tailored to accommodate these individual differences in academic learning, such as arithmetic. Metacognition has been put forward as highly relevant for learning, yet we lack a functional insight into the role of metacognition in academic learning due to several drawbacks in the existent literature. The current project will tackle these drawbacks by using an experimental approach with attention for ecological validity. Therefore, I will introduce a novel methodological approach to measure metacognitive monitoring during academic learning in children. Via carefully designed longitudinal and training studies, I will investigate the association between metacognitive monitoring and the learning of academic skills, such as arithmetic. I will also examine the causality of this association by experimentally manipulating monitoring during academic learning. This integrative approach is aimed to generate unique insights into the role of metacognitive monitoring in academic learning that are impossible to derive from the existing literature. This current research project can provide a critical breakthrough in designing effective learning environments in children.

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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)

New data will be generated. We will collect quantitative data (cognitive tests) by means of group-based testing using both paper-and-pencil measures as well as computerized tasks, developed with Open Sesame (resulting in .csv files), and questionnaires (including demographic information). Raw data files from the computerized tasks will be stored and summary statistics will be inputted in a spreadsheet that is saved as .csv file. The scoring forms of the paper-and-pencil tests will be scanned and stored as .pdf files. Data from these tests will be inputted in a spreadsheet that is saved as .csv file.
No existing data will be reused.

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

Responsible person: Elien Bellon (during) & Bert De Smedt (after)
Storage capacity during research: Paper-and-pencil data and informed consents will be separately archived in a locked room. All digital data will be safely stored on secured (bit lock proteted) network drives to which only the Postdoctoral fellow (Elien Bellon) and the supervisor (Bert De Smedt) will have access. Anonymized datasets (in which all identifying information has been removed) will be exchanged with the co-supervisor (Wim Fias, Ghent University).

Storage after the research : Data will be archived on the bit locked protected OneDrive of the supervisor (Bert De Smedt) for at least 10 years (in line with KU Leuven guidelines). Upon publication, all data, materials and analysis scripts that are included in the respective publication will be made available on the Open Science Framework (OSF) on the account of the Postdoctoral fellow (Elien Bellon;https://osf.io/rufxc) and the supervisor (Bert De Smedt; https://osf.io/cmvdh).

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)

I do not wish to deviate from this principle.

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)

Only children with an active informed consent of their parents will participate. Personal data of the participants are name and date-of-birth, and include signed informed consents. This information is only available to researchers involved in data collection. We will ask permission from the SMEC for collecting the data.
All data will be handled according to General Data Protection Regulation (GDPR; Regulation (EU) 2016/679). No personal identifiers will be used during the research. Privacy will be safeguarded by linking all data to a unique code that contains no personal information. This subject code for identification will be used during data collection as identification on testing materials. Any identifying information will be eliminated from the data files. Personal information (age, contact details) will be stored in a separate password-protected file.

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

All electronic data will be stored on a shared KU Leuven OneDrive for storing confidential data at our department. Only members of the research team will have access to this shared OneDrive. Any data used for reposting on the Open Science Framework or for publication will be fully anonymised.

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DPIA

DPIA

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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FWO DMP (Flemish Standard DMP)

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, .cvs,.pdf, .txt, .rtf, .dwg, .gml, … • NA	*Please choose from the following options:* • <100MB • <1GB • <100GB • <1TB • <5TB • <10TB • <50TB • >50TB • NA	
Study1	Associations between monitoring and short- and middle-long term learning	New Data	Digital, Physical	Observational	.csv, .pdf	<100 GB	Approx. 250 questionnaires to collect demographic data (750 pages) Approx. 250 paper-and-pencil tasks to collect cognitive measures (750 pages)
Study2	Associations between monitoring and long-term learning	New Data	Digital, Physical	Observational	.csv, .pdf	<100 GB	Approx. 250 questionnaires to collect demographic data (750 pages) Approx. 250 paper-and-pencil tasks to collect cognitive measures (750 pages)
Study3	Investigating the causality of the role of monitoring in learning	New Data	Digital, Physical	Observational, Experimental	.csv, .pdf	<100 GB	Approx. 250 questionnaires to collect demographic data (750 pages) Approx. 250 paper-and-pencil tasks to collect cognitive measures (750 pages)

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:

We will not reuse existing data.

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

We will collect data on children's metacognitive monitoring skills and their academic performance and learning. In each of the studies, we will measure children's metacognitive monitoring and their academic performance with custom-made cognitive tasks that will be developed using OpenSesame software. In Study 1 and Study 3, children will additioanlly complete an arithmetic training, with or without a metacognitive monitoring component. In addition to these tasks, we will collect information about relevant non-cognitive factors (demographic and background information, e.g. socio-economic status). We will pseudonymize the collected data and will follow KU Leuven's GDPR code of using and processing personal data. Furthermore, we will submit an ethical application to the Social and Societal Ethics committee KU Leuven (SMEC) and register this application via the PRET tool in the first year of the project, before data will be collected.

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.

- Yes

Personal data of the participants are name and date-of-birth. These are collected for ID purposes during data collection. It also includes contact information (e.g. email address, name of the school, ...) and signed informed consents. This information is only available to researchers involved in recruitment and data collection (i.e. Elien Bellon, Bert De Smedt). The file linking the code and personal identifiers age/dob is only accessible to these researchers. It is stored in a personal OneDrive folder of Elien Bellon. For the remainder of the project, all derivative data will be coded, and thus pseudonymized, and stored in a different Shared OneDrive folder.

We will follow KU Leuven's GDPR code of using and processing personal data. Furthermore, an ethics application for SMEC will be submitted and registered via the PRET tool.
The above applies to all datasets collected in the project.

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).

For each study, we will make a codebook documenting the study design, sampling, measures and variables that allows a secundary data analyst to use the data accurately and effectively. All tests materials will be made available on the open science framework (OSF) account of the KU Leuven researcher Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/). This documentation includes per measure,
how it was constructed and how performance indices were calculated. We will pre-register our data-analysis plan on OSF for each study. It will be made available after publication, along with the respective dataset.

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.

- No

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

Where will the data be stored?

Questionnaires, informed consents and paper-and-pencil tasks will be separately archived in a locked room in the office of Elien Bellon.
Digital data will be stored in a shared folder on OneDrive. This folder will only be accessible by the KU Leuven researchers (Elien Bellon and Bert De Smedt) working on the project. The KU Leuven OneDrive is password protected. The data will be on the shared OneDrive during the project. After completion of the project all data will be transferred to the OneDrive archive of Bert De Smedt.
Pseudonymized data will be made available on OSF when a study is published.

How will the data be backed up?

The data will be stored on the KU Leuven OneDrive. This data storage location has daily automatic back-up procedures.

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

The total estimated amount of digital data is 25 GB. The KU Leuven OneDrive for Business (storage capacity 2 TB) has sufficient storage & backup capacity during the project.

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

Digital data will be stored in a shared OneDrive folder, which can only be accessed by the involved KU Leuven researchers. The data will be pseudonymized by removing personal data and by storing this data separately from the research data on the personal OneDrive of Elien Bellon and Bert De Smedt. Multi-factor authentication is activated for the KU Leuven login of all researchers having access to the data.

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

We expect no costs for data storage and backup on the OneDrive for business during the research project.

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 stored for 10 years in line with the KU Leuven RDM policy.

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

Offline copies (questionnaires and paper-and-pencil tasks) and informed consents will be separately archived in a locked room for the expected 10 year period after the end of the project. They will be destroyed after the 10 year period.
Digital data will be stored in OneDrive folders of Bert De Smedt for at least 10 years.
After publication of a study, the pseudonymized dataset that was analysed in that study will be made available on the OSF account of Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/).

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

We expect no costs for data preservation during the expected retention period.

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 a restricted access repository (after approval, institutional access only, …)

The pseudonymized dataset of each study will be uploaded on the OSF account of the KU Leuven researchers Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/) in a csv format upon publication of a study.

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

The pseudonymized dataset of a study will be shared in a csv format on the OSF platform. It will be available to anyone provided that they give appropriate credit.

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.

The pseudonymized dataset of each study will be uploaded on the OSF account of the KU Leuven researchers Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/) in a csv format upon publication of a study.

When will the data be made available?

The pseudonymized dataset of each study will be uploaded on the OSF account of the KU Leuven researchers Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/) in a csv format upon publication of a study.

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

The pseudonymized dataset of each study will be uploaded on the OSF account of the KU Leuven researchers Elien Bellon (https://osf.io/rufxc/) and Bert De Smedt (https://osf.io/cmvdh/) in a csv format upon publication of a study, under a Creative Commons Attribution license (CC-BY 4.0), so that users have to give credit to the original data creators.

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

We intend to add a PID/DOI/accession number to our dataset but this number is not available yet.

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

There are no costs expected.

6. Responsibilities

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

The data documentation and metadata during the research project will be managed by Elien Bellon, supported by Bert De Smedt.

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

The data storage and backup during the research project will be managed by Elien Bellon, supported by Bert De Smedt

Who will manage data preservation and sharing?

The data preservation and sharing will be managed by Elien Bellon, supported by Bert De Smedt

Who will update and implement this DMP?

Elien Bellon, supported by Bert De Smedt, will update and implement this DMP.