# Plain language summaries for psychological studies

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## Introduction

Easily comprehensible summaries of psychological studies, so-called plain language summaries[1] (PLS), can be a powerful tool for communicating findings of scholarly articles to a wider audience (Kaslow, 2015). However, even though an APA Task Force on *Translating Psychological Science for the Public* published recommendations on this issue in 2014, our knowledge on how effective these lay summaries are for communicating findings of individual psychological studies to broader audiences is at best limited. In contrast, a (compared to psychology) 'long' tradition of translating results of systematic reviews to lay audiences exists in other fields, such as medicine. For example, the Cochrane Collaboration aims to enable laypersons to make informed health decisions and for this purpose, has already provided PLS for almost two decades (see Glenton et al., 2010; Santesso et al., 2015). While studies on Cochrane's PLS found that they were perceived to be more comprehensible (Santesso et al., 2015), results on information recipients' ability to draw conclusions based on these PLS were, however, mixed (Alderdice et al., 2016). For both the Cochrane Collaboration and similar initiatives in other fields (e.g., Clearing House Unterricht for evidence-based teaching methods, see Seidel, Mok, Hetmanek, & Knogler, 2017) meta-analytic or, broadly speaking, systematically reviewed and synthesized findings, serve as a foundation for the provided information. Moving beyond this meta-analytic or systematic review level, it is striking that—even though lay summaries will soon become mandatory for clinical trials under a new EU regulation (European Medicines Association, 2019)—only very few empirical studies (e.g., Raynor et al., 2018) on the effectiveness of lay summaries for communicating the results of individual studies exist (cf. Buljan et al., 2018). As a consequence, it still remains unclear if and how this evidence on PLS for systematic reviews in medicine or educational science can be transferred to the comparably unstructured, less tangible and often multifaceted results of individual psychological studies. Focusing research on PLS in the field of psychology, however, could, in the long run, improve accessibility of psychological research to the broader public and offer a scientific basis for informed decisions and personal conclusions when it comes to psychological questions. In this context, potential target groups of PLS in psychology include—besides interested laypersons, practicing psychologists, (science) journalists and educators—undergraduate and master students.

Moreover, investigating the effectiveness of PLS offers a valuable opportunity to test how individual differences, as well as well-known psychological effects which were until now

[1]In this study, we will use the term *plain language summary* to refer to all research summaries which aim to communicate scientific findings to a broader audience. Other frequently used terms in this context are lay abstracts, lay summaries, translational abstracts or non-technical summaries.

only examined in experimental settings, influence individual perceptions of 'ordinary' scientific abstracts and PLS. More specifically, we will examine (1) the easiness effect of science popularization, and (2) how epistemic justification beliefs influence the perception of these summaries, and (3) if these justification beliefs interact with properties of the summaries.

*Easiness Effect.* Various studies on the easiness effect of science popularization have shown that individuals rate information to be more trustworthy and tend to agree more often to knowledge claims, but also rely overly confidently on their own judgments, if information is presented in an easily comprehensible manner (Scharrer, Rupieper, Stadtler, & Bromme, 2017; Scharrer, Stadtler, & Bromme, 2014, 2019). Even though achieving a higher trust in psychological findings might be in line with the aims of PLS, this also indicates that presenting individuals with PLS instead of ordinary scientific abstracts might result in an overinterpretation of research findings. Taking into account results of the Open Science Collaboration (2015), which cast doubt on the replicability of a number of individual psychological findings, such an overinterpretation could be construed as a dangerous side effect of providing laypersons with PLS. In line with this notion, the APA guidance for Translational Abstracts and Public Significance Statements stresses that "it is imperative that you [the authors] do not overstate or oversimplify your findings or conclusions." (American Psychological Association).

*Justification Beliefs.* How individuals choose between, evaluate and use multiple sources in general also depends on their epistemic beliefs (Barzilai & Strømsø, 2018). In particular, epistemic beliefs on knowledge justification have been shown to influence how individuals act in tasks which are related to multiple source use and multiple document comprehension (e.g., Bråten, Ferguson, Strømsø, & Anmarkrud, 2013). For instance, individuals who believe that knowledge should be verified by authority (i.e., the expertise ascribed to the source of a knowledge claim) might perceive PLS to be less 'scientific' and therefore not trust this source (cf. Thomm & Bromme, 2012, and the notion of secondhand evaluations in Bromme, Stadtler, & Scharrer, 2018).

**Research Questions**

Based on the data that will be collected in this study, we will be able to address three research questions on the effectiveness of PLS, their properties, and the interaction of these properties with individual differences. First, we will compare PLS to ordinary abstracts:

(1) How do different types of abstracts (plain language summaries vs. 'ordinary' scientific abstracts) affect the information recipient's perception of the presented information and how do they influence the information recipient's knowledge acquisition?

Second, there is currently no common ground on how PLS should be structured for individual psychological research (i.e., the corresponding guidance of the American Psychological Association essentially lacks detailed information on this issue). Therefore, we will also draw on recommendations of the expert group on "Summaries of Clinical Trial Results for Laypersons" (expert group on clinical trials for the implementation of Regulation [EU] No 536/2014, but see also Cochrane Methods, 2013) and investigate the inclusion of headlines as one way of making scientific findings more accessible to laypersons.

(2) How do different types of plain language summaries (with/without headlines) affect the information recipient's perception of the presented information and how do they influence the information recipient's knowledge acquisition?

Finally, we will explore the role of individual differences and their interaction with the type of plain language summary.

(3) How do different types of justification beliefs and situational factors, such as text-related epistemic emotions, influence the information recipient's perception of the presented information and how do they affect the information recipient's knowledge acquisition? Are there any interactions between abstract type (PLS with/without headlines, scientific abstract) and individual differences?

**Hypotheses**

The design of this study, which is outlined in detail below, is suited to test the following hypotheses. Hypotheses H1 und H2 are thereby based on the general assumptions underlying the design of PLS, whereas H3, H4, and H5 are based on the easiness effects of science popularization described above.

- H1: Perceived summary comprehensibility
  - H1a. Perceived comprehensibility is higher for PLS with headings compared to PLS without headings (H1a1) and non-PLS (ordinary scientific abstracts; H1a2).
  - H1b. Perceived comprehensibility is higher for PLS without headings compared to non-PLS.
- H2: Knowledge acquisition from summary
  - H2a. Knowledge acquisition is higher for PLS with headings compared to PLS without headings (H2a1) and non-PLS (H2a2).
  - H2b. Knowledge acquisition is higher for PLS without headings compared to non-PLS.
- H3: Perceived study credibility
  - H3a. Perceived credibility is higher for PLS with headings compared to non-PLS.
  - H3b. Perceived credibility is higher for PLS without headings compared to non-PLS.
- H4: Perceived confidence in one's ability to evaluate the study
  - H4a. Perceived confidence in one's ability to evaluate the study is higher for PLS with headings compared to non-PLS.
  - H4b. Perceived confidence in one's ability to evaluate the study is higher for PLS without headings compared to non-PLS.
- H5: Perceived need for cross-evaluation
  - H5a. Perceived need for cross-evaluation is lower for PLS with headings compared to non-PLS.
  - H5b. Perceived need for cross-evaluation is lower for PLS without headings compared to non-PLS.

Further exploratory outcomes are 'Full Text Access' (i.e., do subjects want to obtain the link to the corresponding journal article at the end of the study?), perceived 'scientificness' of the

summary, and epistemic emotions during reading. Exploratory moderator analyses (e.g., with regard to epistemic beliefs) will be conducted.

## Sampling Plan

### *Data collection procedures*

Participants will be recruited at Trier University by means of mailing lists, Facebook groups and flyers. Data collection is scheduled to start on December 9, 2019, and to end on February 11, 2020. All data collection procedures will take place in a single measurement occasion for groups of up to 15 participants at a computer lab of Trier University using the survey software Unipark. First, covariate measurements will be made (i.e., justification beliefs, demographics, etc.). Thereafter, 12 abstracts will be presented in 4 blocks where each block contains 3 abstracts (one of each condition: PLS with/without headlines, ordinary scientific abstract). All abstracts were extracted from the *Journal of Social and Political Psychology* (JSPP, https://jspp.psychopen.eu/index.php/jspp) and subsequently PLS without headings were created by removing headings. After each block (except the last one), there will be a break of 90 seconds. All dependent variables will be assessed after the corresponding text—except the knowledge acquisition test, which will be conducted at the end of each block. After the data collection is finished, each participant receives a compensation of 20 Euros.

Moreover, the following eligibility criteria apply to our sample:

- Participants have to be students at the University of Trier,
- Age: 18 to 70,
- Good reading skills in English and German.

### *Target Sample Size and Sample Size Calculation*

Based on the introductory paper by Judd, Westfall, and Kenny (2017) and their tool on power analysis for experimental designs with more than one random factor (https://jakewestfall.shinyapps.io/two_factor_power/), we performed a power analysis which indicated that a sample of 150 participants would be sufficient to achieve a power of .908 for effect size d = 0.5, Residual VPC: 0.5, Participant intercept VPC: 0.175, Target intercept VPC: 0.175, Participant-by-Target VPC: 0.05, Participant slope VPC: 0.05, Target slope VPC: 0.05, Total number of Targets: 12).

## Variables

### *Manipulated variables*

The independent variable ‘abstract type’ is a within-participants variable with three levels. Study abstracts will be randomly presented as one of the following abstract types:

- PLS with headings
- PLS without headings
- Non-PLS (‘ordinary’ scientific abstract)

### *Non-Manipulated variables*

We will assess the following non-manipulated variables which are relevant to our hypotheses:

- Psychology-specific justification beliefs (Klopp & Stark, 2016)

### *Dependent variables*

The following outcome variables will be assessed:

- Perceived summary comprehensibility (1 to 8 semantic differential)
- Perceived summary scientificness (1 to 8 semantic differential)
- Perceived study credibility (1 to 8 semantic differential)
- Request article link (yes/no)
- Knowledge test answers (true/false)
    - 24 items
    - 2 per study
    - 13 correct items, 11 distractors
- Perceived confidence in one's ability to evaluate the study (1 to 8 Likert scale)
- Perceived need for cross-evaluation (1 to 8 Likert scale)
- Epistemic Emotions: curiosity, boredom, confusion, frustration, using the short version of the EES questionnaire (Pekrun, Vogl, Muis, & Sinatra, 2017)

***Covariates***
Demographic variables (i.e., age, sex, study subject, etc.), self-reported ability to evaluate knowledge claims of scientific studies (1 to 8 semantic differential), English proficiency, etc.

***Indices***
The following scales will be computed as mean scores:

justification by authority, personal justification, and justification by multiple sources

**Design Plan**

***Blinding***
Subjects will not know what kind of abstract they receive—however, they will obviously see if headings are included or not.

***Study design***
We will use a within-design with one factor (PLS with headings, PLS without headings, non-PLS).

***Randomization***
Abstracts will be presented in four blocks with three abstracts each (one of each condition).

Assignment of studies to these abstract types as well as the order of studies and the order of blocks will be randomized.

**Analysis Plan**

***Statistical models***
We will use mixed models to analyze our data. Random factors are study (to which the abstract belongs) and subject (i.e., participant). Independent variables are dummy coded abstract type variables.

***Transformations***
In the knowledge acquisition test measure, all answers will be recoded from 'true/false' to 'correct/incorrect' before data analysis.

***Inference criteria***

We will use the standard $p < .05$ criterion for determining if the estimated effects of (dummy coded) abstract type conditions are significantly different from those expected if the null hypothesis was correct.

***Data exclusion***

Specific cases may be eliminated if major protocol deviations occur (e.g., answers which imply that inclusion criteria were not fulfilled).

## References

Alderdice, F., McNeill, J., Lasserson, T., Beller, E., Carroll, M., Hundley, V., . . . Clarke, M. (2016). Do Cochrane summaries help student midwives understand the findings of Cochrane systematic reviews: The BRIEF randomised trial. *Systematic Reviews*, *5*, 40. https://doi.org/10.1186/s13643-016-0214-8

American Psychological Association. Guidance for Translational Abstracts and Public Significance Statements: Demonstrating the Public Significance of Research. Retrieved from https://www.apa.org/pubs/journals/resources/translational-messages

Barzilai, S., & Strømsø, H. I. (2018). Individual differences in multiple document comprehension. In J. L. G. Braasch, I. Bråten, & M. T. McCrudden (Eds.), *Educational psychology handbook series. Handbook of multiple source use* (pp. 99–116). New York, London: Routledge.

Bråten, I., Ferguson, L. E., Strømsø, H. I., & Anmarkrud, Ø. (2013). Justification beliefs and multiple-documents comprehension. *European Journal of Psychology of Education*, *28*(3), 879–902. https://doi.org/10.1007/s10212-012-0145-2

Bromme, R., Stadtler, M., & Scharrer, L. (2018). The provenance of certainty: Multiple source use and the public engagement with science. In J. L. G. Braasch, I. Bråten, & M. T. McCrudden (Eds.), *Educational psychology handbook series. Handbook of multiple source use* (pp. 269–284). New York, London: Routledge.

Buljan, I., Malički, M., Wager, E., Puljak, L., Hren, D., Kellie, F., . . . Marušić, A. (2018). No difference in knowledge obtained from infographic or plain language summary of a Cochrane systematic review: Three randomized controlled trials. *Journal of Clinical Epidemiology*, *97*, 86–94. https://doi.org/10.1016/j.jclinepi.2017.12.003

Cochrane Methods (2013). Methodological Expectations of Cochrane Intervention Reviews (MECIR): Standards for the reporting of Plain language summaries in new Cochrane Intervention Reviews 2013. Retrieved from https://methods.cochrane.org/sites/default/files/public/uploads/pleacs_2019.pdf

European Medicines Association (2019). Clinical Trial Regulation. Retrieved from https://www.ema.europa.eu/en/human-regulatory/research-development/clinical-trials/clinical-trial-regulation

Expert group on clinical trials for the implementation of Regulation (EU) No 536/2014. Summaries of Clinical Trial Results for Laypersons: Recommendations of the expert group on clinical trials for the implementation of Regulation (EU) No 536/2014 on clinical trials on medicinal products for human use. Retrieved from https://ec.europa.eu/health/sites/health/files/files/clinicaltrials/2016_06_pc_guidelines/gl_3_consult.pdf

Glenton, C., Santesso, N., Rosenbaum, S., Nilsen, E. S., Rader, T., Ciapponi, A., & Dilkes, H. (2010). Presenting the results of Cochrane Systematic Reviews to a consumer audience: A qualitative study. *Medical Decision Making : an International Journal of the Society for Medical Decision Making*, *30*(5), 566–577. https://doi.org/10.1177/0272989X10375853

Judd, C. M., Westfall, J., & Kenny, D. A. (2017). Experiments with More Than One Random Factor: Designs, Analytic Models, and Statistical Power. *Annual Review of Psychology*, *68*, 601–625. https://doi.org/10.1146/annurev-psych-122414-033702

Kaslow, N. J. (2015). Translating psychological science to the public. *American Psychologist*, *70*(5), 361–371. https://doi.org/10.1037/a0039448

Klopp, E., & Stark, R. (2016). *Entwicklung eines Fragebogens zur Erfassung domänenübergreifender epistemologischer Überzeugungen [Development of a domain-general epistemological beliefs questionnaire]*, Unpublished manuscript, Department of Educational Science, Saarland University, Saarbrücken, Germany.

Open Science Collaboration (2015). Estimating the reproducibility of psychological science. *Science*, *349*(6251), aac4716. https://doi.org/10.1126/science.aac4716

Pekrun, R., Vogl, E., Muis, K. R., & Sinatra, G. M. (2017). Measuring emotions during epistemic activities: The epistemically-related emotion scales. *Cognition & Emotion*, *31*(6), 1268–1276. https://doi.org/10.1080/02699931.2016.1204989

Raynor, D. K., Myers, L., Blackwell, K., Kress, B., Dubost, A., & Joos, A. (2018). Clinical Trial Results Summary for Laypersons: A User Testing Study. *Therapeutic Innovation & Regulatory Science*, *52*(5), 606–628. https://doi.org/10.1177/2168479017753129

Santesso, N., Rader, T., Nilsen, E. S., Glenton, C., Rosenbaum, S., Ciapponi, A., . . . Schünemann, H. J. (2015). A summary to communicate evidence from systematic reviews to the public improved understanding and accessibility of information: A randomized controlled trial. *Journal of Clinical Epidemiology*, *68*(2), 182–190. https://doi.org/10.1016/j.jclinepi.2014.04.009

Scharrer, L., Rupieper, Y., Stadtler, M., & Bromme, R. (2017). When science becomes too easy: Science popularization inclines laypeople to underrate their dependence on experts. *Public Understanding of Science (Bristol, England)*, *26*(8), 1003–1018. https://doi.org/10.1177/0963662516680311

Scharrer, L., Stadtler, M., & Bromme, R. (2014). You'd Better Ask an Expert: Mitigating the Comprehensibility Effect on Laypeople's Decisions About Science-Based Knowledge Claims. *Applied Cognitive Psychology*, *28*(4), 465–471. https://doi.org/10.1002/acp.3018

Scharrer, L., Stadtler, M., & Bromme, R. (2019). Judging scientific information: Does source evaluation prevent the seductive effect of text easiness? *Learning and Instruction*, *63*, 101215. https://doi.org/10.1016/j.learninstruc.2019.101215

Seidel, T., Mok, S. Y., Hetmanek, A., & Knogler, M. (2017). Meta-Analysen zur Unterrichtsforschung und ihr Beitrag für die Realisierung eines Clearing House Unterricht für die Lehrerbildung. *Zeitschrift für Bildungsforschung*, *7*(3), 311–325. https://doi.org/10.1007/s35834-017-0191-6

Thomm, E., & Bromme, R. (2012). It should at least seem scientific! Textual features of "scientificness" and their impact on lay assessments of online information. *Science Education*, *96*(2), 187–211. https://doi.org/10.1002/sce.20480