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ARTICLE

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Direct Replication in Experimental Communication Science: A Conceptual and Practical Exploration

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Abstract

Replication is generally considered a keystone of the scientific enterprise. Unfortunately, in communication science, there is a lack of clarity on what a replication actually entails, and to what extent replicators may deviate from original studies. In order to support researchers in conducting, evaluating, and justifying the setup of replications of communication science experiments, we provide a taxonomy of replication types. We argue that researchers almost always need to adapt some elements of an original communication study to meaningfully replicate it. The extent to which deviations—ranging from mere updates to deliberate deviations and additions—are permissible, however, depends on the motivation behind conducting a replication study. We distinguish three basic motivations: verification of an original study's findings, testing the generalizability of an original study (which we further differentiate into the generalizability of study outcomes vs. theoretical claims), and extending an original study beyond the original goals. We argue that these motivations dictate what types of deviations are permissible and thereby determine the type of replication (i.e., direct, modified, and conceptual). We end with concrete recommendations for replicators: to specify the motivation to conduct a replication study and clearly label and justify any deviations from the original study for all study elements.

Keywords

communication science; conceptual replication; direct replication; replication; stimulus development

1. Introduction

Replication is generally considered a keystone of the scientific enterprise (e.g., Dienlin et al., 2021; Keating & Totzkay, 2019; McEwan et al., 2018; Nosek et al., 2022). Popper (1959/2002, p. 64) famously noted that "non-replicable single occurrences are of no significance to science." In other words, the credibility of a scientific claim increases when a finding is repeatedly shown under sufficiently similar circumstances using sufficiently similar procedures and materials, that is, if it is replicated.

The process of replication is also what we allude to when we say that "science is self-correcting." Whenever the findings of invalid research designs, poor measurement, faulty statistical analyses, selective use of data, HARK-ing, p-hacking, or other misguided practices enter our body of literature (John et al., 2012), we expect, in principle, that someday a replicator will come and correct the score. That said, we also know that correction may take a long while. Relative to studies we call "original work," replication studies are still scarce (Keating & Totzkay, 2019). The reasons are well-known: Replication studies are hard to get published (McEwan et al., 2018), not well-cited (Hardwicke et al., 2021), and sometimes regarded as unduly critical (Peterson & Panofsky, 2021) and second-rate work (Spellman, 2015).

There might also be another reason why researchers shy away from conducting replication studies: Often, after close inspection of the original work, it becomes unclear which elements of a study should and can be replicated. Should the physical setting be replicated? What if the stimulus is outdated? Should one reproduce faulty designs, too? Unreliable measures? The non-blind experimenter? The ad hoc outlier handling? And would a reviewer—especially when this person is (affiliated with) the original author—agree that what a replicator might consider a small deviation or improvement still does justice to the original study? Clearly, without a common disciplinary understanding of what a good replication entails, it becomes challenging to conduct and publish one.

To illustrate this challenge, members of the current author team were once found ineligible for a social science replication grant because they proposed to update the original newspaper articles that Hovland and Weiss used in their 1951 study about source credibility. The authors' line of thought was that these articles (e.g., about how TV could come to replace movie theaters) would not elicit the same responses in a current audience as they did in 1951 and thus should be adapted. They were told by the funding agency that, unfortunately, the call was for "direct" replications only and that any deviations proposed to the original materials, design, and procedures would render applications ineligible.

In this article, we argue that, in fact, the opposite is true: For most social science research, direct replications *require* deviations from the original study. This holds especially true for experimental studies in the field of communication science, where (mediated) stimuli and response patterns are almost by definition subject to temporal and cultural changes. At times, the impossibility of using the exact same material is rather obvious: Adolescents of today would not respond similarly to video games from the 90s, even if required systems would still be available. Music from decades ago does not elicit the same affective responses today. And stimuli that were once regarded as scandalous may now be considered mild. Yet, this does not mean that it is impossible to reliably replicate studies that relied on such materials.

The aim of this article is to help researchers who aspire to conduct and publish replications of experimental communication science studies decide which original study elements can be reasonably altered while still performing a faithful and meaningful replication of the original study. We aim to provide such researchers with argumentation, as well as a discipline-specific taxonomy, to help them substantiate how and why any methodological changes still facilitate replication of the original study and its claims and to systematically categorize their replication in light of these changes.

In order to pursue this goal, in the following, we present a systematic conceptual analysis of replication studies in experimental communication science. Unlike other conceptual analyses of replication studies (e.g., Brandt et al., 2014; LeBel et al., 2018; Steiner et al., 2019), our analysis will question *why* researchers would want to replicate a particular study, as a point of departure. We will review different aims that could motivate a replication study and show how these motivations logically imply decisions on whether or not to update elements of original studies. We will look in detail at study elements that could be considered for updating and to what extent updates change the status of a replication.

Interestingly, prior analytical work on replications (e.g., Asendorpf et al., 2013; Schmidt, 2009) generally does not include an explicit definition of replication studies. However, based on this prior work, we are able to define a replication study as a study that adopts elements from a specific previous study, in order to reassess this previous study and/or the theoretical mechanism it tested. This means that replications can be methodologically very similar to a specific original study (e.g., operationalizations and methods are fully adopted), but also somewhat dissimilar (e.g., only the hypotheses are adopted). This also means that replications by definition challenge previous work: If a replication shows different results than the original study, our perspective on the original study may (and probably should) change. And, although in the Popperian paradigm all empirical studies can be considered challenges to theoretical claims, replication studies are a special case because they challenge specific *findings* of (other) researchers. This may be one of the reasons why replication work is sometimes considered adversarial, while it is rarely intended to be (Peterson & Panofsky, 2021). Note that in this article we discuss replications—which include the collection of new data—and not reproductions (e.g., Asendorpf et al., 2013) or robustness checks (e.g., Nosek et al., 2022), which verify claims by reanalyzing original data.

In our analysis, we focus on the discipline of communication science and experimental studies. We first explain this choice below, using foundational experiments as examples.

2. Replicating Experiments in Communication Science

The field of communication science is characterized by a large variety of employed research methods, including qualitative analysis, cross-sectional surveys, content analysis, and experiments. As chiefly experimental studies can provide evidence for causal relationships, they play a fundamental role in substantiating theory. For example, empirical evidence for a very central theory such as cultivation theory (Gerbner, 1969)—explaining how representations of reality by fictional and non-fictional media systematically distort perceptions of the social world over time—was almost exclusively obtained through content analyses and longitudinal surveys regarding people's media use and beliefs about crime and other social problems (Morgan & Shanahan, 2010). Because of a lack of experimental work, uncertainty persists about the precise causal mechanisms at play, and the explanatory power of the theory remains subject to debate (Potter, 2014).

Over the last two decades, communication science increasingly recognized the fundamental role of experiments and showed a stronger interest in experimental work (Rains et al., 2020). Some of the resulting studies are currently among the most cited in the field. However, few efforts are being made to replicate them (Keating & Totzkay, 2019; for a notable exception, see the special issue edited by McEwan et al., 2018). In 2018, the authors of the current article conducted a survey among 171 communication scholars, asking which experiments within the discipline of communication science were most in need of replication. The result was a list of 10 studies shown in Appendix I of the Supplementary Material. Most readers studying or teaching communication science will acknowledge these studies for their centrality to the field and will agree that attempts to replicate them would strengthen the discipline; yet few attempts have been made. We believe that if aspiring replicators have a better idea of how to explain their replication projects to readers, including precise reasons to conduct a replication and possible adaptations needed for fidelity, this will increase replication attempts in our field. Therefore, in the subsequent section, we review three typical motivations to replicate a study. We argue that the motivation for conducting a replication study directly guides decisions on how to approach potential alterations to the original study.

3. Motivations to Conduct Replication Studies: Verification, Generalizability, and Extension

Why would researchers want to conduct a replication study? First and foremost, researchers may simply regard replication as a fundamental aspect of the scientific process, a way to build on existing knowledge by reconfirming or refuting previous findings. More specifically, researchers may want to identify the boundary conditions under which particular effects occur—whether certain factors moderate or limit the generalizability of the findings, thereby providing a more nuanced understanding of the phenomenon. At other times, researchers may have doubts about the results of the original study, or they wonder whether particular research design choices may have unintentionally influenced the results.

In many replication studies, the motivation that drives replication remains unspecified or is expressed as a combination of all the reasons above. In this section, we argue that it is important to a priori specify the motivation behind conducting a replication, because the degree to which replicators can deviate from the original studies' setup is contingent on the motivation. We distinguish three basic motivations to conduct a replication study: *verification* of an original study, testing the *generalizability* of an original study (which we further differentiate into the generalizability of study outcomes vs. theoretical claim), and *extending* an original study beyond the original goals.

3.1. Verification

Perhaps the most basic motivation to conduct a replication study is to verify the reliability and validity of previously reported findings. This motivation may stem from aiming to repeatedly demonstrate an effect. Although such verifying replications should be standard practice and a sign of a healthy, progressing field, individual replication attempts often elicit defensive responses from original authors or their affiliates (Peterson & Panofsky, 2021), who may feel peers are casting doubt on the original study's correctness or validity. Surely, there can be reasons why someone could be legitimately doubtful of a study or of its results: counter-intuitive findings, unusually strong effects, small sample sizes, many barely significant findings, the use of non-standard or strongly shortened measurement instruments, ad hoc or excessive outlier removal,

seemingly unplanned comparisons between experimental conditions, a lack of descriptive data, or a lack of transparency overall, to name a few (cf. John et al., 2012). In case of such doubt, a primary, and probably healthy, response would indeed be to verify whether the results of such a study could be replicated. If the original results are based on a methodological error or a questionable analysis choice, they should likely not be replicated.

In light of this, it is not surprising that replication studies which aim to verify an original finding will often be heavily scrutinized for any design or operational deviation that might potentially explain a different result. For that reason alone, a replication spurred by a verifying motivation generally requires strict obedience to the original design and procedures. Nonetheless, as we will argue below, even a verifying replication study may need to introduce slight deviations in order to be valid.

3.2. Testing Generalizability

A second motivation to conduct a replication study could be to test whether study results can be generalized. First, the issue of generalization can pertain to the original study directly: the question of whether the observed results may have been contingent on particular choices that the original researchers made in terms of study design and methodology. Can results be replicated if a particular study element—e.g., the control condition, or the dependent measure—is deliberately modified? Second, the issue of generalizability can concern the theoretical claim that was studied. Can the theoretical claim be confirmed when it is tested in a different way, in different contexts, using different stimuli and different research populations? These two aspects are specified as follows:

Study generalizability has in common with the verification motivation that it reassesses the original study rather than the theoretical mechanism the study aims to test. The focus of such replications is on whether the original study's findings can be replicated with deliberately modified study elements, e.g., using slightly different stimuli, measures, or settings (in a different country, in a different language, in the field or a lab). However, such replication studies—which we will label "modified replications"—are not fueled by a motivation to exactly verify the original results but rather by an interest in testing the robustness of the original findings.

If such a modified replication study yields similar results as the original study, it provides evidence that the results are robust and generalize to the modified methodological conditions. If it yields different results, it is suggestive of potential boundary conditions of the original finding. Formulated more skeptically, modified replication attempts may help clarify whether original findings are explainable by idiosyncratic stimuli, measures, procedures, or contexts, instead of a generalizable theoretical model. From a technical perspective, testing whether a study hinges on specific study elements requires that replicators abide by original design and procedural choices closely and only deviate regarding these specific elements of interest (see also Steiner et al.'s, 2019, causal replication framework). Nonetheless, as was the case for verifying replications, we will argue that such close adherence to the original study may mean that, in practice, some study elements may have to be slightly updated.

Theory generalizability as a motivation entails that the focus is less on the original study's methodology but rather on the causal mechanism it tested. Thus, the focus is on retesting the hypotheses of the original study

and whether these can be reconfirmed with *different* designs and methodological choices. As a result of this shift in focus, any deviation from the original study would seem permissible as long as the tested hypotheses are still the same. In fact, in such studies—often dubbed "conceptual replications"—adherence to original design choices can be regarded as a limitation: If for some reason the original methodological choices, and not the focal theoretical mechanism, drive the effects found, studies staying too close to the original cannot corroborate the generalizability of a theoretical claim. Still, a genuine challenge in conceptual replications is to determine whether deviations from the original study (e.g., new stimuli or new measures) activate and measure the same theoretical concepts and mechanisms.

3.3. Extension

A third motivation of replicators could be to extend the original work. Such extensions are complementary to any of the three types of replications listed above. One can extend a verification-motivated replication by adding, for example, a quasi-experimental moderator, mediator, manipulation check, or dependent variable—as long as the addition is inconsequential for the verification purpose (i.e., the original procedures)—to find out more about the mechanisms driving the original study's effects. One can do the same for modified or conceptual replications aimed at testing the generalizability of a study or a theoretical claim. In the latter, one may introduce extra stimuli and measures in the procedure if methodologically viable. As such, the extension motivation by itself does not determine to what extent changes in original study elements are permissible—This is determined by the motivations of verification or testing generalizability. Instead, the extension motivation is decisive in whether to *add* elements to an original study.

All in all, in this section we argued that the motivation to conduct a replication study relates to different types of replication studies and to different degrees that replicators can afford to diverge from the original studies' design and procedures. In the following section, we will discuss whether modifying particular study elements should be considered a deliberate deviation or merely an update.

4. Deliberate Deviation or Mere Update?

In the previous section, we argued how replicators' motivations may warrant deviations from original methodological choices. But what exactly are deviations? What if a replicator translates measures and stimulus materials to make them accessible to a different population or to make them applicable in a new culture or country? What if measures and stimuli are only updated to make them fit current times? When is such a translation or update permissible, or perhaps even necessary? In order to specify this, we will, in the following, distinguish different types of adaptations to an original study: a mere update, an inconsequential deviation, and a deliberate deviation from the original study. The argument we make is this: Verification is still possible with updated materials and also with—carefully justified—inconsequential deviations. Deliberate deviations, however, are associated with a different motivation (i.e., testing generalizability) and replication types (i.e., modified and conceptual replications). We will discuss these types of deviations for seven elements of experimental (communication science) studies: sample, setting, procedure, design, measures, stimuli, and analyses.

4.1. Reproducing the Sample

An element of an original study that a replication study needs to alter, almost by definition, is the study sample. Usually, an experiment requires a sample of naive participants, which means that, even if it were practically possible, it is not sensible to re-recruit members of an original sample for a replication study. Next to no longer being blind to the study's purpose, the original sample is also no longer "original" in its sample characteristics as its average age or education level may have changed. Instead, replicators may aim to reproduce sample *features*, for example, gender, nationality, ethnicity, political, religious or cultural views, or social group membership.

In communication science experiments, such sample features may or may not be important in explaining participants' responses to experimental stimuli in a replication. In many studies, sample features are considered coincidental and of peripheral importance to the mechanism being tested. Nonetheless, verification-motivated replicators may wish to reproduce the features of the original study's sample. The goal would then be to recruit a similar group of participants to avoid the possibility that a different outcome emerges due to some unknown population characteristics. However, if sample features are considered theoretically irrelevant in the original study, employing a sample with a priori different features (e.g., resulting from a systematically different recruitment method) may even be permissible for replications with a verification motivation. We refer to such deviations as an *a priori inconsequential deviation*. For instance, McGuire and Papageorgis (1961) used students as participants in their famous inoculation experiment, but no theoretical reason was mentioned for this choice. In such cases, replicators may deem it appropriate to resort to a different sample. Also, if different sample features are observed a posteriori (e.g., observing a different average age or education level despite aiming to reproduce original sample features), this can generally be considered as an inconsequential deviation.

In other original studies, (sub)sample features are part of hypothesizing and study design. Iyengar and Hahn (2009), for example, studied differences in media selection in Democratic versus Republican voters. Replicators of such studies, driven by verification or study generalizability motivations, should use subsamples with similar features. However, in modified or conceptual replications, deliberate deviations from the original sample can be used to test whether findings generalize to different populations (e.g., recruit voters of other political parties in another country).

4.2. Reproducing the Research Setting

A replication research setting is also a study element that will generally differ from an original study. Research setting involves features such as the era or period in which a study is conducted, cultural characteristics, geographical location, and also the physical location (e.g., in a research lab). In particular, era-related characteristics of a research setting can be entirely non-reproducible. If it is not feasible to reproduce the research setting itself, replicators, instead, could focus on closely reproducing the features of the research setting.

A changed research setting (e.g., a different country, era, or physical location) may involve translation to make methods fit the new setting. If the research setting is considered to play a peripheral role, such translations are permissible even for replication with a verification aim—For example, Fransen et al. (2024) replicated McGuire and Papageorgis' (1961) inoculation effects in the Netherlands. If deviations in setting

are observed or planned a priori, replicators with a verification motivation should explain and justify whether they consider such deviations inconsequential. For example, Gorn's (1982) experiments on the effects of music in advertisements were conducted in a lecture room. As this setting was not considered to be theoretically relevant, replication with a verification aim could be conducted in an online setting (Vermeulen & Beukeboom, 2016).

Research setting can also be a central part of an experimental design or research question; for example, Roozenbeek et al. (2020) studied the effectiveness of pre-bunking strategies against misinformation across countries. In such cases, replicators with a verification motivation should aim at reproducing features of the original research setting as closely as possible (thus conducting the replication in the same countries). Any alteration could constitute a consequential deviation that limits the verification goal.

In contrast, deliberate deviations in the research setting can be used to test the generalizability of a study beyond its original setting. For example, the negation bias in stereotype communication was first tested in Dutch (Beukeboom et al., 2010) and later replicated in five other European languages (Beukeboom et al., 2020).

4.3. Reproducing the Procedure

Especially in experimental research, research procedures may considerably influence study outcomes. Consider procedural features such as informed consent, participant instructions, measurement order, or the presence of manipulation checks. In most experiments, procedures have been meticulously designed precisely because experimenters know they may significantly influence participant responses. Replicators with a verification motivation should therefore reproduce original procedures as closely as possible. That may also mean, in case these are unclear or incompletely reported, that original procedures have to be reconstructed based on secondary information or reasoning (e.g., Vermeulen et al., 2014). The responsibility of a replicator with a verification motivation is to—possibly despite having to work with frustratingly limited information—aim to faithfully reproduce original procedures as closely as possible. In such cases, contacting the original authors may be helpful. Note, however, that the value of replication lies also in independent verification of initial findings and that original authors may (even unknowingly) be biased towards their own findings. In any case, if there are known a priori deviations, replicators with a verification motivation should explain and justify why they consider such deviations necessary or inconsequential.

In contrast, replicators motivated to test generalizability may typically focus on the procedure to make deliberate deviations. Given that experimental procedures are influential, it may be a valid concern whether original results stem from an unintended feature of the research procedure. Using deliberate procedure deviations in modified replications, this can be purposefully tested. Note that adding new elements to a procedure *after* the original procedure is finished is inconsequential and thus should not be considered a deviation. Adding such new elements can serve extension purposes.

4.4. Reproducing the Design

Original experimental research designs (i.e., the number of experimental factors, their levels, and between or within-subject manipulation) are usually unproblematic to replicate. Commonly, experimental designs are

well-documented and experimental factors are clearly explained. Replicators with a verification motivation should aim to use the same design as the original study.

It may, however, occur that the focus of a replication attempt concerns only a subset of the full design, for example, a particular comparison between conditions. Replicators—even those with a verification motivation—could then choose to adapt the original design by only including the experimental conditions necessary to replicate the original comparison: The omission of the other conditions is an inconsequential deviation. In a similar vein, replicators with an extension motivation may opt to add between-participant conditions without consequentially deviating from the original.

Importantly, whether or not design adaptations are consequential depends on the type of design. Between-participant designs tolerate adaptations (added or omitted conditions) much better than within-participant designs. Adaptations to within-participant designs are very often consequential as they affect a study's procedure and, therefore, potentially also its results. Replicators with a verification motivation should avoid such consequential deviations. Those with a generalizability motivation may however use deliberate deviations in experimental design to test whether findings generalize beyond the original design.

4.5. Reproducing the Measurements

Communication science journals often allow for extensive method sections (Berger et al., 2010), so dependent measures should generally be well-described. It also becomes increasingly normative to share the complete methodology (Dienlin et al., 2021). This makes it, in principle, feasible to reproduce original measures in a replication study. However, particularly in older publications, often not all items of a scale are reported. Nevertheless, replicators with a verification motivation should aim to reproduce original measures as closely as possible.

Yet, it is important to recognize that measures, like stimuli (see below), are subject to interpretation and may be perceived differently across eras, cultures, and countries. For example, in his experiment on cultivation, Shrum et al. (2011) measured television viewing through items like "I have to admit, I watch a lot of television." In a 2023 diversified media setting, it is very likely that this question will be interpreted differently. In case a replicator is convinced that a measure or a scale item does not capture the same latent concept as it did in the original study, it becomes questionable whether it should nonetheless be included in a replication. A more valid approach would be to aim at constructing a modern counterpart of that measure or item: an update/translation to the current time and cultural context. In fact, in such cases, updating outdated measures or items would be a requirement for a verifying replication.

4.6. Reproducing the Stimuli

Reproducing stimuli from original studies is a central challenge for replicators. Especially for experimental studies in communication science, which rely heavily on media messages as stimuli, it is often impossible to re-use original stimuli as they have lost their original relevance or meaning. When the aim is to verify an original study, updating or translating is then required. As an example, eight out of the 10 "cornerstone" experiments of communication science presented in the Supplementary Material (Appendix I) use media messages as stimuli. Media messages are almost guaranteed to evoke different responses in participants from another era or culture

than they originally did. We argue that in such cases, and when one is motivated to verify an original study, it is bad practice to nevertheless use the exact same (outdated) stimuli.

A first-hand example is a three-study replication by some of the current authors of Gorn's (1982) experiment testing music effects in advertising. In the first two—supposedly exact—replications, we used the same music for a 2013 Dutch sample as Gorn used for his 1980's Canadian sample (Vermeulen et al., 2014). The music effects—obviously, with hindsight—were different in 2013, but that taught us little about the replicability of Gorn's original findings. A third study that employed updated musical stimuli in fact yielded results similar to those of Gorn.

The question of how to adapt measures and stimuli in such a way that is likely to produce the same responses in current participants as in the original study, or to translate a stimulus in such a way that it will produce the same responses in participants from other cultural backgrounds, is highly complex. The basic idea is that stimulus *features* should be reproduced in a current cultural context, instead of the stimuli themselves (D. M. Slater et al., 2015). This is done by conducting a content analysis of stimulus features and then systematically re-creating these features in geographical, contextual, and era-congruent stimuli (M. D. Slater, 1991). In Appendix II of the Supplementary Material, we present a practical guide on how to do this for stimuli and measures as commonly used in communication science experiments. To make the task more tangible, we discuss different stimulus features: source features, message features, and channel features. Additionally, we discuss recipient state features, which are stimulus features used to induce a particular psychological state in recipients (e.g., task involvement), which in turn may change a response to another stimulus. We also explicitly discuss that in updating stimuli from a previous communication science experiment, replicators should not only focus on features in which stimuli (experimentally) differ but also on features in which they are the same (e.g., if both stimuli were realistic then, they should be realistic now).

4.7. Reproducing the Analyses

A commonly used approach to determine whether a replication confirms the outcomes of an original study is testing whether the observed effect sizes are sufficiently similar, i.e., whether the original effect size's point estimate is included in the replication's 95% confidence intervals (cf. Asendorpf et al., 2013; LeBel et al., 2018). Due to the extensive method sections common in communication science (Berger et al., 2010), replicators can often clearly identify what type of statistical model was used and how the effect of interest was estimated. However, exact data preprocessing steps (e.g., what exclusion criteria were used and how missing values were treated) are often not reported. This lack of transparency makes it difficult to follow the original analysis procedure in every detail. If the aim is to verify the original study's findings, replicators should attempt to replicate the original analysis procedure as closely as possible, which may involve taking steps such as contacting the original authors, in search of missing information. That said, many data preprocessing steps are arbitrary, and different choices could be considered valid (e.g., Simonsohn et al., 2020; Steegen et al., 2016). Hence, one could argue that certain aspects of the analyses need not be perfectly aligned with the original study (e.g., thresholds for outlier removal). Again, it is important to a priori deem such (minor) deviations as inconsequential in order to still conduct a verifying replication.

It is important to mention here that extension-motivated replicators can explore alternative ways to analyze the data without sacrificing the ability to verify the original study's findings. As long as the original analysis is

reproduced, one can additionally report alternative analyses without endangering a replication's verification goal. As an example, Vermeulen et al. (2014), in their replication of Gorn (1982), needed to replicate Gorn's in part faulty data analysis method to compare effect sizes but also presented an improved analysis.

In this section, we reviewed how replication studies can include adaptations and deviations from the original study. We argued that updating and translating measures and stimuli is often required if one is motivated to verify an original study's findings. Replication studies with a verification goal may also include inconsequential deviations (e.g., in sample, setting, procedures, and analyses) if these are clearly justified. In contrast, deviations may also be deliberately introduced with a motivation to test generalizability. In the next section, we will bring this together and distinguish how different motivations relate to different types of replications, which allow for different types of deviations.

5. A Taxonomy for Replications In Experimental Communication Science

Several authors have previously presented taxonomies of replication studies (e.g., LeBel et al., 2018; Lykken, 1968). Notably, Kelly et al. (1979) developed a taxonomy of replication types specifically for experimental communication research. After applying their taxonomy on replication studies in the discipline, they found that studies that had made alterations in the stimulus materials were by far the most prevalent. This finding corroborates our observation that in order to replicate communication science experiments, it is often necessary to update stimuli.

LeBel et al. (2018) introduced a taxonomy that orders replications according to their similarity with the original study. On a broader level, they distinguish *direct* from *conceptual* replication, arguing that they serve different epistemological purposes. Only replication types subsumed under *direct replications* (exact, very close, and close replications that only differ in contextual and procedural aspects) are regarded as sufficiently similar to an original study to be considered evidence for the original study's claim. Because of their methodological similarity to the original study, they allow for the falsification of a hypothesis and thereby question the credibility of an effect (LeBel et al., 2018; Meehl, 1978). Interestingly, LeBel et al. also consider replications that use different stimuli as sufficiently close if hypothesis, constructs, operationalization, and population characteristics are the same—In their taxonomy, this would be a close replication, the furthest away from the original study that can still be seen as a direct replication.

Conceptual replications, in LeBel et al.'s (2018) framework, are characterized by deliberately introduced differences in study elements, such as different constructs, operationalizations, samples, or stimuli. Unsupportive evidence from such studies cannot question the original study's finding because it is unclear whether it is a falsification of the original hypothesis or simply highlights contingency on particular study elements that were changed. As such, conceptual replications can only provide insights into the generalizability of presumably replicable effects or hypotheses.

Our taxonomy (Figure 1) builds on previous work, particularly LeBel et al. (2018) and Steiner et al. (2019), but also differs in two substantial regards: First, we explicitly include researchers' motivations to replicate a study and argue that these motivations automatically imply particular replication types. Second, we explicate the difference between mere translations/updates, inconsequential deviations, and deliberate deviations. In frameworks such as LeBel et al. (2018), replication types are only differentiated by the amount

of study elements that differ. As a result, our taxonomy better facilitates replication researchers to evaluate and report the setup of their replication studies. Also, our taxonomy differs by integrating direct (aiming to verify by staying methodologically close to the original), modified (systematically exploring one or few deviations), and conceptual ([dis]similar studies testing the same hypotheses) replications in one framework.

Similar to prior taxonomies, we order replication types according to their similarity with the original study. Any individual replication study may be placed on this similarity continuum and may occasionally fall between those exemplary types that we highlight and discuss in the following. On the highest level, we differentiate direct, modified, and conceptual replications. We argue that these three types of replications serve different epistemological purposes, which can be expressed as researchers' motivations to conduct a replication (see our discussion of motivations above).

highly similar ⟷ highly dissimilar

	Direct replication			Modified replication	Conceptual replication		
	Exact replication*	Very close replication	Close replication	Proximate replication	Far replication	Very far replication	
Motivation	Verification			Generalizability			Extension
Goal	Verifying the original study's finding using the same or sufficiently similar methodology			Testing whether the original study's finding is contingent on particular study elements	Testing the overall generalizability of the theoretical claim		Extending the original study design and goals
Hypothesis	same	same	same	same	same	same	same and additional
Constructs *(theoretical constructs under investigation)*	same constructs	same constructs	same constructs	same constructs	same constructs	any valid constructs	
Experimental design *(e.g., between-vs. within-design, levels of manipulation, ...)*	same design	same design	same design	similar to a very close or close replication, except for focal, deliberate deviations in study element(s)	any valid design	any valid design	Depending on motivation/goal: Verification inconsequential additions to the original design Generalizability Any valid additions to the original design
Measures *(operationalization of instruments)*	same operationalization	same or updated/translated operationalization	same or updated/translated operationalization		any valid operationalization	any valid operationalization	
Stimuli *(e.g., message features, source/channel features, situational features, recipient features, ...)*	same stimuli	same or updated/translated stimuli	same or updated/translated stimuli		any valid stimuli	any valid stimuli	
Sample *(e.g., population features such as age, gender, distribution, education ...)*	similar sample (all characteristics are the same)	similar sample (relevant characteristics similar)	a priori inconsequential deviations		any valid sample	any valid sample	
Setting *(e.g., physical location, era/time, cultural characteristics, ...)*	same setting	similar setting (relevant aspects similar)	a priori inconsequential deviations		any valid setting	any valid setting	
Procedure *(e.g., instructions, order of elements, ...)*	same procedure	similar procedure (relevant aspects similar)	a priori inconsequential deviations		any valid procedure	any valid procedure	
Analysis *(e.g., type of data analysis approach, outlier removal, imputation ...)*	same analysis	same analysis	a priori inconsequential deviations		any valid analysis	any valid analysis	

Figure 1. A taxonomy for experimental replications in communication science. Notes: It is important to note that the classification does not provide any evaluation, all types of replications have their value in the general research endeavor; the taxonomy was inspired by, and builds on, the taxonomy proposed by LeBel et al. (2018); * in communication science, exact replications are almost always impossible to conduct, as media stimuli (and measures) require updates in order to be meaningful, and changes in sample, setting, and procedure are often inevitable.

If the motivation is verification, i.e., whether or not an original finding can be replicated with the same or at least sufficiently similar methodology, researchers need to make sure that their replication attempt indeed qualifies as a direct replication of the original study. Such replications generally require strict obedience to the original study elements or at least need to be sufficiently similar. Based on the nature of deviations, direct replications can be further distinguished into exact, very close, and close replications. Exact replications keep all study elements exactly the same. Although theoretically conceivable, exact replications are rarely, if at all, possible in (experimental) social science (Nosek & Errington, 2020) and particularly in communication science. As discussed earlier, it is almost always inevitable that a replication study deviates from one or more study elements. In the case of communication science experiments, particularly stimuli are contingent on time and context and easily outdated. In "very close" replications, such study elements are *updated* in order to enable a valid replication of the original study. Note that when we discuss dissimilarities, we purposefully differentiate between updates, (a priori) inconsequential deviations, and deliberate deviations (a difference compared to prior frameworks). If the aim of a replication is to verify the original findings (i.e., a direct replication), only necessary updates are allowed. As argued earlier, a stimulus from the 1950s may not elicit the same responses in participants today. Yet, it may be possible to create an updated stimulus that is context- and time-appropriate and elicits the same response in participants today as the "old" stimulus did in participants in the 1950s.

Another distinction within direct replications is expressed in the difference between a very close and a close replication. Whereas a close replication aims to adhere to the original design and methodology as much as possible and only introduces necessary updates to a few study elements, a close replication also allows deviations that are a priori deemed inconsequential to still allow for verification of the original study's claim. We purposefully limit these to the study elements sample, setting, procedure, and analysis, as those are likely to differ slightly in many verification-motivated replication attempts. Whether a deviation is a priori inconsequential may be hard to justify. A starting point may be to investigate the specificity of the original hypothesis and the original study's claim. For example, did the original hypotheses make auxiliary assumptions relating to these particular study elements explicit? Is the theoretical claim clearly limited to a particular sample, procedure, or context? Did the original study somehow explicate boundary conditions relating to the particular sample, setting, or procedure originally implemented? Overall, we argue that replications that only introduce justifiably inconsequential deviations, while keeping the same or merely updating all other core elements, can still be regarded as direct replications aimed at verifying the original finding.

Like prior authors (e.g., Hendrick, 1990; Steiner et al., 2019), we include a replication type that does not fall under direct replications nor under conceptual replications but sits somewhere in between. Such modified, but still proximate, replications—which are quite prevalent—are conducted when a replicator is no longer aiming at verifying an original study's claim but investigates the generalizability of an original study in light of particular methodological choices that were made. In other words, such replications test whether the original study's finding is contingent on particular methodological aspects. Such studies can be regarded as *modified replications*—deliberately varying one or more study elements, while keeping the same or merely updating all others. For example, a research team could be interested in testing whether the original findings still hold if a modified dependent measure or a modified stimulus is used (i.e., study generalizability). Clearly, such replications do not qualify as direct because they intentionally introduce deviations from the original study. Yet, they should be distinguished from conceptual replications, which are focused on merely testing

the same hypothesis using any valid, and potentially more different, methodology. For modified replications, the focus remains on the original study itself and on potential methodological questions that it raised. When modified replications yield the same result as the original study, they provide evidence that the findings generalize to the modified methodological element. In contrast, a failed modified replication provides a first indication of the boundary conditions of the original finding.

A third type of replication, subsumed under the label *conceptual replication*, aims at testing the generalizability of a theoretical claim (i.e., theory generalizability) while implementing dissimilar methodologies compared to the original study. The focus thus is on retesting the hypotheses of the original study (i.e., *theory generalizability*). In such studies, any deviation from the original study is permissible as long as they are theoretically valid and the tested hypotheses are still the same (LeBel et al., 2018). In fact, in order to prove the generalizability—not just the verifiability—of a theoretical claim, deviations compared to the original study are necessary. We distinguish *far* replications, where the theoretical constructs are still the same and the replication thus re-tests the original study's theoretical claims exactly, from *very far* replications, where theoretical constructs may be slightly varied to test the original study's claims in a broader sense.

Finally, our taxonomy also includes a motivation that can be combined with all three (direct, modified, conceptual) types of replications: extension. With an extension motivation, the goal is to gain additional insights compared to the original study. Motivated by extending and better understanding the original study's findings, replicators can add methodological aspects (e.g., additional measures, experimental groups) to their replication study. As already argued, however, the core motivation (i.e., verification, study generalizability, theoretical generalizability) may limit what type of additions are allowed.

Our taxonomy facilitates researchers (including replicators, reviewers, and peers) to conduct, evaluate, and justify the setup of replications of communication science. We urge replicators to (a) clearly identify their motivations to conduct a replication and, in line with their motivation, (b) justify any updates or deviations to the original study's design. We acknowledge that the types of replications that we emphasized as exemplary oversimplify the range of potential replications. That said, we strongly believe that they will help researchers in placing replication attempts on the similarity continuum and, thereby, evaluate in what ways these replications can say something about the replicability of the original study's findings or the generalizability of the theoretical claim.

6. Conclusion and Discussion

In order to facilitate researchers to conduct, evaluate, and report the setup of replication studies, we provided a taxonomy of replication types. We argued that researchers almost always need to update and/or translate some elements of an original communication study to meaningfully replicate it, and we provided guidelines and examples as to how to approach and justify such updates and translations. We also discussed the difference between inconsequential and deliberate deviations from an original study. We posited that the extent to which a deviation is permissible depends on the motivation to conduct a replication study. Here, we distinguish three basic motivations: verification of an original study's findings, testing the generalizability of an original study (which we further differentiate into the generalizability of study outcomes vs. theoretical claims), and (in combination with one of the other three motivations) extending an original study beyond the original goals.

Because these motivations dictate what types of deviations are permissible, they also determine the type of replication (i.e., direct, modified, and conceptual).

6.1. Limitations and Challenges

Although we believe that our taxonomy helps in categorizing replication attempts and facilitates researchers to consider and justify what types of deviations are permissible depending on the motivation they have, we acknowledge certain limitations. First, the distinction between direct and conceptual replications may not always be as clear-cut as we suggest here. By introducing a third type of replication (modified), we already propose a more fine-grained differentiation, yet still different researchers may interpret, for example, the status of particular deviations differently, leading to ambiguity in the proposed categorization and potentially diverging opinions on what constitutes a replicated effect. In such cases, we hope our categorization will facilitate the scientific debate.

Second, we acknowledge certain constraints in conducting replications that cannot be solved even with a granular taxonomy. For example, certain large-scale experiments may be difficult to replicate due to their size and resource-intensiveness. Similarly, replicating certain experiments may pose ethical challenges, especially if the original study involved controversial or sensitive procedures.

Another challenge relates to how to deal with replication outcomes. It is likely that replication studies (across all types discussed above) produce diverse outcomes, including partial replications, variations in effect sizes, or even contradictory results. Making sense of these outcomes is not as trivial as it seems. A non-replicated finding could mean that the original study was a false positive, but it could also be that the replication is a false negative. In fact, cumulative evidence for a study's results requires several (direct) replications, a time-consuming and slow process that, at least currently, does not seem to be valued sufficiently in our field (Dienlin et al., 2021).

6.2. Recommendations for Replicators

Following our discussion and taxonomy, we recommend the following guidelines for researchers interested in conducting and publishing a replication study. First, clearly specify the motivation behind conducting your replication study: Do you want to (a) verify the original study's findings, (b) test the study's contingency on particular methodological choices, or (c) test the generalizability of the theoretical claim? Additionally, do you aim to (d) extend the original study in any way?

Second, specify as concretely as possible any deviations from the original study for all study elements (see Figure 1) and explain whether these are updates, inconsequential deviations, or deliberate deviations. In case of verification aim (direct replication), justify why the planned deviations are deemed necessary and why you deem them sufficiently similar or *inconsequential* (e.g., update due to a different era, translation to a new context). In case of focus on study generalizability (modified replication), again, justify any planned deviations but additionally specify which *deliberate* deviation(s) are made and what the aim of this deviation is (e.g., to test whether findings generalize to a different measure). In the case of focus on theory generalizability (conceptual replications), any theoretically valid deviation is permissible, yet we nonetheless urge you to discuss (dis)similarities to the original study.

Third, in case of a complementary extension motivation, specify which extensions you make and which further insights to the original study you aim to gain. Also specify the convoying motivation (verification, study generalizability, or theory generalizability) and justify the deviations and extensions accordingly (e.g., new measures are added after the original procedure).

Fourth and finally, diligently report the protocol of your replication study and make it available to reviewers and peers (e.g., as supplementary material and/or in a public repository). This will help others to (a) scrutinize your design choices, (b) conduct subsequent or even collaborative ("many-labs") replication efforts, and (c) specify their own design deviations more easily.

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Conflict of Interests

The authors declare no conflict of interests.

Supplementary Material

Supplementary material for this article can also be found at the Open Science Framework (https://osf.io/wbmh6).

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