Leveraging the Open Science Framework in Clinical Psychological Assessment Research

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Abstract

The last decade has seen enormous advances in research transparency in psychology. One of these advances has been the creation of a common interface for openness across the sciences – the Open Science Framework (OSF). While social, personality, and cognitive psychologists have been at the fore in participating in open practices on the OSF, clinical psychology has trailed behind. In this paper, we discuss the advantages and special considerations for clinical assessment researchers’ participation in open science broadly, and specifically in using the OSF for these purposes. We use several studies from our lab to illustrate the uses of the OSF for psychological studies, as well as the process of implementing this tool in assessment research. Among these studies are an archival assessment study, a project using an extensive unpublished assessment battery, and one in which we developed a short-form assessment instrument.

Keywords: open science framework, open science, replicability, transparency, meta-science, preregistration

Public significance statement: The present article reviews various tools the open science framework offers to clinical and assessment researchers, demonstrating their operationalization and utility and calling for clinical researchers to become more engaged with open science practices.

Leveraging the Open Science Framework in Clinical Psychological Assessment Research

Psychological research methods and practices are undergoing major scrutiny and revision in light of the ongoing “replication crisis”, marked by noted failures to replicate major psychological research findings, along with increased appreciation of the regular use of problematic research methods and practices (e.g., John, Loewenstein, & Prelec, 2012; Pashler & Wagenmakers, 2012; Spellman, 2015). Most of this attention has focused on the areas of social and cognitive psychology, with critiques often specific to the types of research typical of these areas (e.g., in-lab experimental manipulations with convenience samples of undergraduate students). Given this, it is not surprising that many of the reforms and new tools being developed also cater to this audience, despite the wide variety in research tools and methods used by psychological scientists in other areas (Tackett, Lilienfeld, et al., 2017; <https://osf.io/preprints/psyarxiv/uwus7/>).

Clinical psychologists, among others, have thus been slow to enter this broader conversation occurring in the field, to the detriment of improving our research methods and practices as well as ensuring that new tools can flexibly accommodate the unique constraints of clinical psychological research questions (e.g., ensuring the confidentiality of diagnostic information). Large-scale replication projects like those in social and cognitive psychology (Open Science Collaboration, 2015; Simons, Holcombe, & Spellman, 2014) have not yet been conducted in clinical psychology to empirically quantify the extent of replicability issues in clinical science (Tackett, McShane, Bockenholt, & Gelman, 2017). However, many of the same problematic practices that have contributed to low replication rates in social and cognitive psychology, such as limited statistical power (Cuijpers, 2016), publication bias (i.e., a tendency to publish only significant findings, providing a skewed view of the evidence; Hopewell, Loudon, Clarke, Oxman, & Dickersin, 2009), and selective reporting of results (e.g., reporting only those results which are statistically significant; Leichsenring et al., 2017) are problems extending across psychological subfields. Perhaps in clinical

psychology more than in other lines of psychological research, a lack of replicability of findings has the potential to negatively impact the individuals we study through misinformed assessment, treatment, and policy decisions. Open practices substantially reduce these threats to replicability and increase the public accessibility of science (Munafò et al., 2017). There is a clear and critical need for the normalization of open practices in clinical psychology in order to combat these threats to the replicability of our science and well-being of the populations we study. The focus of the present manuscript is to discuss one particular advancement in open practices – the Open Science Framework (OSF; <https://osf.io>), an open source software platform that supports the transparency of science research. The OSF has been central to the early mobilization of efforts to increase openness and replicability in psychology.

Clinical psychologists remain scarce in use and promotion of the OSF resources, though this tool is beginning to gain attention among clinical science researchers. One important use of the OSF is through PsyArxiv, a psychology-specific preprint server hosted on the OSF (<https://psyarxiv.com/>). A preprint is an early version of a scientific paper uploaded to an open access repository for feedback and open dissemination prior to journal copyrighting. A preprint on PsyArxiv can stand alone, or it can be integrated as part of a larger project on the OSF, meaning that it may have all of the associated data, protocols, and other study materials posted along with it. Since the creation of PsyArxiv in late 2016, the cumulative number of papers posted with the tag “Clinical Psychology” has jumped from N=6 to N=61 in September 2017, with 52 of these having been uploaded in the first nine months of 2017 (excluding theses and dissertations; see *Figure 1*). Nonetheless, in comparison to the 400+ preprints with the tag “Social Psychology” on the OSF, clinical psychology research clearly lags behind in the use of this preprint server.

It is our aim in the present manuscript to provide a brief introduction to the OSF, then discuss three recent examples from our lab which illustrate some of the ways clinical assessment

researchers may find the OSF helpful, and end with a brief summary and a look ahead for clinical assessment researchers in an increasingly open science world.

Introduction to the OSF

The OSF is a broad infrastructure facilitating many different aspects of an open and reproducible science. With many components and rapid evolution, we do not aim to describe all the OSF can facilitate, and new features and applications of the OSF are constantly emerging thanks to its open source nature. We hope to offer some potential starting points for other clinical assessment researchers, to establish initial familiarity with the infrastructure from which researchers can branch out and individualize their use of the resources. The OSF was created by the Center for Open Science (COS), whose mission is “to increase openness, integrity, and reproducibility of research” (COS Strategic Plan, 2017). The OSF essentially functions as the practical infrastructure for the COS, which hosts the many tools, services, and platforms developed to promote open and replicable science (COS, 2017).

Among many benefits of the OSF, it is freely available, open source, and not-for-profit, and accompanied by numerous educational and training mechanisms (another major aim of the COS). In addition, its many tools and platforms are integrated, offering the potential for a comprehensive and seamless workflow. The OSF includes “services” such as pre-/registration and file storage (pre-registration here refers to the practice of publicly posting a study’s design, materials, hypotheses, and data analysis plan prior to data collection), and interfaces with numerous “add-ons” such as DropBox, Google Drive, and Zotero, and includes “OSF Collections” which facilitate an efficient and integrated workflow across a variety of research tasks and needs. The first step to using the OSF is to set up an account. As with virtually any feature of the OSF, the website offers numerous tutorials, with many more readily available on the internet, through free scheduled webinars hosted by COS, and, increasingly, through conference workshops – for setting up and managing your

account, see: <http://help.osf.io/m/account>. A helpful presentation outlining how to use the OSF can also be found here: <https://osf.io/gbm6v/> (Corker & Michaelson, 2017). Seasoned users of the OSF promote the idea that virtually all aspects of one's workflow can be supported by and integrated within the OSF infrastructure. For the uninitiated, we recommend starting with one or two features to become acquainted with the OSF, and building an individualized usage of the OSF that suits a particular researcher, lab, or research program.

There are several other modalities for achieving greater openness in research (e.g. posting study protocols as supplemental materials to a journal's website, posting data to the investigator's lab website, or using other pre-registration servers), many of which facilitate goals of openness and transparency. However, we present the OSF as preferable to these alternatives for several reasons. First, the OSF is a centralized, integrative framework. This vastly increases the ease of access of study materials, data, pre-registrations, and other necessary elements of study reproduction, as all can be added to the same searchable platform. Second, public projects on the OSF are open access. While online supplementary materials including study protocols and study data increase the reproducibility of a study, if the study is published in a journal that is not open-access, the study is only reproducible for individuals with paid access to the journal in question. As the OSF hosts preprints (via PsyArxiv), study materials, and data, it provides the option to make research fully reproducible even from beyond the paywall. Third, the OSF supports data storage even if its funding ceases. As the OSF has a "preservation fund", enough resources exist to allow read access for at least 50 years after funding ceases (if that were to happen; c.f. <http://help.osf.io/m/faqs/1/726460#Backup-Preservation-Policy>). Individual lab website domains are not maintained for this length of time, and therefore, there is no assurance that data will remain open when labs close, move between institutions, or undergo personnel changes. It is for these

reasons that, for some researchers, the OSF may be preferable to alternative modes of increasing scientific reproducibility.

Among the many functions and tools the OSF offers, we start by describing, in specific terms, a few of the ways that we have found the OSF useful in our own research. We hope that these examples illustrate clear relevance and utility for other clinical assessment researchers, and perhaps present an easy starting point to integrate ongoing clinical assessment research programs with the OSF infrastructure. Specifically, we describe the use of the OSF across three projects which may resonate with clinical assessment researchers: (1) a registered research study analyzing previously collected assessment data (i.e., that cannot officially be “pre-registered”), (2) a personality assessment study involving latent variable modeling and the use of an extensive but unpublished assessment protocol, and (3) a study involving the creation and initial validation of a short-form personality pathology scale.

Using the Open Science Framework with Archival Data Analysis

Study registration practices present unique challenges for researchers who use archival datasets, but these challenges are complemented by immense advantages. In the currently accepted standard definition of pre-registration, scientists submit their study design, materials, hypotheses, and data analysis plan to a public repository such as the OSF prior to the collection of any data (Gonzales & Cunningham, 2015; Nosek, Ebersole, DeHaven, & Mellor, 2017). While clinical trial registries have been mandated since 2005 in the medical research community (Laine et al., 2007), currently, clinical psychological researchers are not required to submit information about study design into a clinical trials registry before data collection (although this may change if the definition of clinical trials is expanded; see American Psychological Association Science Government Relations team, 2017). Similarly, the practice of keeping pen and paper laboratory notebooks documenting each step of the research process has been standard among many researchers for years (even now, in

electronic format), but this is not done in a standardized or publicly accessible way (i.e., these notebooks may not be available to or interpretable by anyone other than the original researcher).

One of the main recommendations for improving the transparency and replicability of psychological science thus far has been to engage in a more rigorous version of public pre-registration. However, when a researcher works with data that were collected years or even decades prior to their entrance to the project, this is not feasible, and as a result, many researchers opt out of the public registration process entirely. However, study registration is no longer exclusive to new projects or to confirmatory research – whatever state the project is in, it can benefit from being open (Nosek et al., 2017). A recent project from our lab illustrates the obstacles and rewards inherent in the registration of archival assessment studies.

Time and flexibility are part and parcel of doing careful, large-scale research with special populations, but this does not bar these studies from registration. These studies can take years to complete: from 2007-2009, our lab collected intake data for 346 families in what would become a multi-year longitudinal study. This project was called the Childhood Personality and Behavioral Outcomes Study in Toronto, Canada (CPBS-T). Pre-collection pre-registration for studies such as CPBS-T were not at all common practice in psychology at that time, as the final wave of data collection for this project commenced prior to the creation of the OSF in 2013 (Center for Open Science, 2017). CPBS-T implemented numerous assessments – of personality, psychopathology, cognitive functioning, social behavior, and more. In studies such as this, planning and organization can only go so far – flexibility in design is unavoidable. Newly validated measures may be added to the study as they become available (e.g. edition changes in the Diagnostic and Statistical Manual of Mental Disorders; e.g., American Psychiatric Association, 2000), and collaborators or graduate students may join the project, wishing to add new material to the protocol mid-collection. It takes a

village to complete these studies, and as constitutional amendments show, it is virtually impossible to fully pre-register a village's ideology.

Uncertainty is another inescapable element of these rich datasets. Aside from the greater flexibility new study personnel introduce to study design, these people contribute to the nigh-infinite repository of research questions that may be asked of this data after collection is complete. We cannot predict all future hypotheses that will be tested in one of these datasets: one of our current studies draws from CPBS-T intake data to examine child personality trait associations with the general factor of psychopathology (Brandes, Herzhoff, Smack, & Tackett, in prep). This is a research question we first set out to investigate in 2016, even though collection for this wave was completed in 2009 – even if we had pre-registered the study at the time of data collection, we would not have anticipated doing these analyses. Since that time, a number of other analyses have been performed on this dataset to answer a variety of independent research questions related to personality, psychopathology, life stress, and social relationships, to name but a few (see Herzhoff & Tackett, 2012; Tackett, 2011; and Tackett, Daoud, De Bolle, & Burt, 2013 for a sampling of these studies). Researchers such as ourselves are often partially acquainted with our data prior to the construction of analytical plans – incidental contact may occur during the course of other investigations. Therefore, future analytical plans are not as independent of the data as they are with untouched data from smaller, faster studies – as is intended with pre-registration. However, this is not an insurmountable barrier to registration.

Pre-registration and post-analysis registration of materials on the OSF is no more difficult for archival research than for any other study. When pre-registering a study, researchers submit the protocol, materials, and data analysis plan prior to testing their research questions. This can be done with either a priori hypotheses or planned exploratory analyses. Though the primary goals of pre-registration are transparency and the restriction of researcher degrees of freedom (i.e., making

contingent analytic decisions in an effort to obtain a desired result; Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012), these are not incompatible with the desire for data quality assurance. Rules for handling collection issues or excluding outliers prior to analysis can (and should) also be preregistered in the analytical plan. All analyses conducted during prior studies should be specified to enhance the quality of the record and maximize transparency. While research can be pre-registered as purely exploratory, decision trees can also be specified in order to restrict analytical degrees of freedom, even in this context. Study materials can even be posted after analysis, as we have done with our most recent project on the general factor of psychopathology (<https://osf.io/9fv7z/>). If pre-registration was not originally part of the study plan (as was the case with our general factor study), transparency can still be practiced all the same. Though pre-registration is no longer possible once analyses have commenced, study protocols, materials, scoring scripts, and data may still be shared on the OSF along with preliminary findings. Doing either kind of registration confers unique benefits to studies with archival data.

The benefits of open science practices for archival (and all other) research are both prosocial and selfish. Making study materials, data, and code open both benefits the scientific community and the scientist conducting the research, as curation eases use for future generations of scientists (and ourselves). Registration and transparency also limit Type I error (i.e., false positives; although a move away from the use of p -values for dichotomous decision-making is nigh; McShane, Gal, Gelman, Robert, & Tackett, 2017), and elicit greater trust in results from the research community. Finally, published studies that post data and preprints publicly may receive much greater exposure than those that are published without these forms of openness. Here we explore the multifold advantages of study registration.

There is a common saying among advocates of open science: “Your best collaborator is you five years ago, and they don’t respond to email”.¹ This is perhaps most true when data collection and analysis are separated by years in time. Whether it be data organization and labeling, explanations for missing cases, or rationale for analytical decisions, archiving studies in full view of other scientists forces us to organize our workflow in the most interpretable way possible. Seeing projects through others’ eyes yields substantial savings in time and frustration for our future selves – this has been a lesson well-learned in our own study registration. As we have discovered in making our materials open for our project on the general factor of psychopathology, one does not learn how messy their analytical code is until they think about posting it for others to see. Centralizing all study material with the public in mind minimizes individual differences in organization and reduces confusion for those who may later have to navigate our project (including our future selves).

Beyond convenience, there are also scientific benefits to registering studies on the OSF including promoting greater care and specification of hypotheses, enhanced protection against Questionable Research Practices (QRPs; for examples of specific QRPs and their impact on research replicability, see Ioannidis, 2005 and John, Loewenstein, & Prelec, 2012), greater methodological reproducibility, and, potentially, more widespread scientific consumption. Registration is especially useful for archival assessment research, as the data is often readily available, so the time between hypothesis generation and result interpretation can be very short. Pre-registration also facilitates greater faith in study findings among reviewers and scientific consumers, as it guards against many (though not all) QRPs including p-hacking, selectively reporting significant results, and hypothesizing after results are known (or HARKing; Kerr, 1998). HARKing is especially relevant to the study of existing datasets, as incidental contact with data may put archival researchers at unique

¹ This quote has been attributed to many, including evolutionary biologist Mark T. Holder (2013) & statistician Philip B. Stark (2014), but the original source is not definitively known.

risk for unintentional HARKing through simple memory failure and motivated cognition. We have to ask ourselves: do I have this hypothesis because it follows from the theoretical background on my research question, or because I saw it in the data several years ago? Now that all analytical plans and reproducible analysis scripts for our current project are posted to a centralized location for each project on the OSF and described in detail, this uncertainty may be lessened in future independent investigations of CPBS-T data. We will know precisely what information we have previously been exposed to.

When materials and preliminary findings are made open, transparency and study reproducibility are better maintained during the publication process, as well. In exploratory studies, reviewers may be deterred from asking investigators to HARK, as their preliminary results have already been reported and timestamped as such on the OSF. Further, as studies such as CPBS-T are often methodologically extensive, journal word limits threaten the reproducibility of our findings. Open materials and scoring scripts ensure that even if we cannot report our protocol in detail in a manuscript, interested individuals can reference our OSF page for full information should they wish to reproduce any part of our protocol. Registered studies such as this are often more useful to other researchers, both for the purposes of collaboration and research consumption.

Registered studies receive more widespread exposure than those that are not – studies with open data receive anywhere from 10-70% more citations than similar studies without open data (Piwowar et al., 2007; 2013). Additionally, papers that are published with a posted preprint received up to 500% more citations than papers that are published without one (Gentil-Beccot, Mele, & Brooks, 2009). These findings even hold when research is randomly assigned to use these open practices or not, indicating that the advantages of openness are not due to sampling bias (Garouri et al., 2010). Preprints also allow researchers to solicit feedback prior to publication from a broader scientific audience than the small number of editors and reviewers that might see it otherwise.

Beyond the scientific community, preprints also give access to scientific research to those outside of academia, as preprints do not require payment or institutional access. In the interest of making science accessible to the media and the public (who often fund it to begin with), preprints allow researchers to achieve the goal of openness while still participating in the traditional peer review process.

Maintaining data for future generations of researchers (and our future selves) requires organization, documentation, and care. Registering studies on the OSF benefits investigators such as ourselves by increasing the likelihood that these goals will be met. It also ensures that findings derived from our special datasets will be as trustworthy as possible, and will make our extensive efforts to conduct these studies worthwhile.

Using the Open Science Framework with an Assessment Battery/Protocol

A second example of a clinical/personality assessment study making use of the OSF framework and resources comes from a multi-method/multi-trait examination of child personality (Tackett, Lang, Markon, & Herzhoff, 2018). This study also made use of archival and pooled data, as does much of the research in our lab. Our data collection often involves fairly resource-intensive protocols with children and parents in the community, and collecting even moderately large sample sizes (e.g., $N \sim 300$) typically takes several years. Given this, we aim to leverage measurement harmonization across many studies and pool data whenever possible. Under these types of research approaches, formal “pre-registration” with this study (Tackett, Lang, et al., 2018) was not possible (similar to the study described in our first example). In addition, this particular project was in progress as our own lab became familiar with OSF and related tools (a process which is still very much ongoing for our team), and thus, represents an example of what researchers might do with projects that are near completion by the time they begin to integrate their lab with OSF.

In this study, we were interested in applying multi-trait/multi-method latent variable modeling to a comprehensive battery of thin-slice child personality data, which also included ratings of child personality from mother and father report (Tackett, Herzhoff, Kushner, & Rule, 2016). The study is essentially a construct validation effort with the goal of examining the use of complex psychometric modeling to simplify and condense complex multi-trait, multi-method data. The data themselves had been previously published (Tackett, Herzhoff, et al., 2016), thus, the study is far from an ideal candidate for a strict pre-registration. How, for this type of research effort, might the OSF be helpful?

One particularly helpful component of the OSF is the ability to post more extensive materials than would be allowed in a standard manuscript. In Tackett, Lang, et al. (2018), we sought to promote the use of standardized lab paradigms to capture short segments of behavior (“thin slices”), which are later coded for child personality information. The original battery we developed included 15 such tasks, or situations (Tackett, Herzhoff, et al., 2016). Should these situations be useful paradigms for eliciting childhood personality traits, we would hope that other researchers, clinicians, and educators, might use the same tasks as an additional measure of child personality. Indeed, we use a number of these thin-slice situations across multiple other datasets in our lab (as of yet unpublished) to ultimately facilitate data pooling across multiple studies. Surely, the same goals of standardized administration would hold for data collected from other labs, which would actually be even more valuable to allow for cross-lab data pooling, a practice shown to be superior to simply increasing sample size when the goal is precise estimation of an effect (McShane & Böckenholt, 2014).

Thus, there is a clear incentive for multiple researchers and labs to use a standard protocol for thin-slice personality trait assessment. Historically, one might hope that interested researchers would connect via email to share materials and harmonize efforts. Yet, these extra steps may inhibit

collaboration and standardization if researchers do not think they are worth the effort. For this study, we capitalized on the potential offered by the OSF and posted our full thin-slice protocol (<https://osf.io/6xr4y/>), easily accessible to any researchers or clinicians considering incorporating these tasks into their own batteries. Posting full assessment protocols (when not protected by copyright or infringing on ethical boundaries, such as protected materials) has a number of benefits for the broader field: conserving researcher resources by minimizing “re-creation of the wheel”, enhancing replicability by facilitating cross-lab standardization, and promoting opportunities for cross-lab data pooling which increases power via larger sample sizes and opportunities for hierarchical modeling of heterogeneous effects.

In addition to posting the full thin-slice battery protocol on the OSF, we also used the OSF infrastructure to post full syntax and detailed results. Posting syntax is helpful for promoting replicability, both through allowing researchers to ensure “identical” analyses are, in fact, identical, but also by promoting quality control through enhanced opportunities for catching errors in code. This may be especially important for researchers often fitting complex latent variable models, with many opportunities for slight differences in code to exist far beneath the surface of the digestible summary of analyses that would typically be published in a final manuscript. In this particular study, the complete results were also incredibly long and detailed, far too complex to accurately summarize in a final published manuscript. Yet, others may be interested in specific aspects of the detailed results; for example, if conducting a meta-analysis or constructing an abbreviated thin-slice battery with a particular purpose in mind (e.g., if a researcher wants to select only those tasks that maximize variability on trait agreeableness). By using the OSF infrastructure, researchers can easily post their fully detailed results without concerns about page limits or the need for overly simplistic narrative summaries. As any researcher who has conducted a meta-analysis knows, the chance to obtain comprehensive quantitative data from published studies without needing to go through original

study authors would substantially increase study inclusion rates, result in more accurate quantitative data by minimizing researcher error in preparing data for meta-analysts, and greatly reduce burden and stress on the meta-analytic research team, as well. Thus, in this study, despite being near the final stages of completion when our lab began incorporating OSF infrastructure, it offered numerous opportunities to strengthen the impact, reach, and reproducibility of our work.

Using the Open Science Framework with a Scale Construction Study

Another useful application of the OSF relevant to psychological assessment is in pre-registration of scale construction studies. Our lab has worked through this process with a validation study for the creation of a short form of a longer, more established measure. The Dimensional Personality Symptom Itempool (DIPSI) was created to measure personality pathology traits in youth (De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006). The original DIPSI included 172 items across four higher-order domains and 27 lower-order facets. It was from the original Dutch to English, and validation studies of the English language measure suggest excellent psychometric properties (Decuyper, De Clercq, & Tackett 2015). However, at 172 items, this measure is often considered prohibitively long for parents to fill out about their children, whether in research or applied settings. This prompted the creation of a short-form (DIPSI-SF) to ease the burden of administration and facilitate inclusion of child personality pathology measures in research and application.

Our lab has an archival dataset of 451 parent and 225 youth reports on the long-form of the DIPSI. Using item response theory (IRT), the three most informative items from each facet were selected, with some adjustments made for breadth of coverage and agreement between parent and youth report analyses, resulting in an 81-item DIPSI-SF that preserves the breadth of the original (Reardon & Tackett, 2017). Initial analyses with the original sample included estimating internal consistency of the short form scales and examining content overlap with the long form measure. As

mentioned in Smith, McCarthy, and Anderson (2000), however, a major “sin” of short-form creation is to fail to validate the new measure in an independent sample. Thus, we decided to pre-register validation efforts in a new, independent sample

(https://osf.io/634wk/?view_only=9b1c095128354984aacc2d5cc433d87f).

Although this seemed to be a good candidate for an assessment-focused pre-registration, we were not aware of any existing pre-registrations or templates to work from. Indeed, existing pre-registration templates are often designed around in-lab experimental social and cognitive psychology research. Thus, we wanted to attempt an initial effort at a measure development pre-registration, certain that we would make mistakes along the way and others would greatly improve on this attempt in future work. In thinking about the steps involved in such a project, we came up with the following list: 1) decide which variables of interest to include in nomological network analyses, 2) outline expectations and boundary conditions to demonstrate validity in the new short-form, 3) develop specific hypotheses about structural models and directional hypotheses for the relationship between the DIPSI-SF domain scores and key criterion variables, and 4) list any further exploratory analyses (e.g., facet-level analyses) that do not have specific, directional hypotheses. The OSF is a useful and straightforward platform for pre-registering these steps before any analyses are conducted.

Thinking carefully about step one (which measures to include) ahead of data collection will not be new to any assessment researcher; the primary difference is in publicly documenting it. We chose variables that we knew had well-established relationships with personality pathology as measured by the original, long-form DIPSI after reviewing the literature. For step two, we needed to think about what to accept as evidence for scale reliability and validity. This meant that we needed to decide on (and record in our pre-registration) various minima/maxima thresholds and/or boundary conditions around parameter estimates. For example, in our creation sample, the internal

consistency of the facets ranged from .63 to .85. Thus, we decided that the internal consistency for our 3-item short-form facets in the new sample must be above .60 to be deemed acceptable.

Similarly, because our validation sample is large ($N = 700$), statistical significance is not a useful metric (almost all correlations may be significant; Sullivan & Feinn, 2012; also see McShane et al., 2017 on general problems with reliance on statistical significance). Based on standards established in the broader literature and overall findings for similar scales and constructs, we pre-registered a threshold of .25 as required to interpret a correlation as providing meaningful convergence/divergence in the nomological network.

For step three, we needed to think through exactly what we expected from our structural models and domain-level associations with our criterion variables. First, we outlined predictions about model fit based on previous work on the long form of the DIPSI, predicting that models in the short form sample would preserve this same structure. Next, for each variable we were measuring as a part of the nomological network, we recorded specific, directional hypotheses about its relationship to DIPSI Disagreeableness, Emotional Instability, Introversion and Compulsivity. In straightforward language, we listed all of our hypotheses in our pre-registration document. Finally, regarding step four, we listed all planned analyses for which we did not have specific, directional hypotheses. These include facet-level associations for each of the 27 facets with our criterion variables, as well as associations with demographic variables such as gender and race/ethnicity. Because we do not have specific hypotheses for these analyses, the purpose of listing them as part of our pre-registration is to make clear that they are exploratory, reflect an important part of understanding how the new short form is functioning, and clarify that these analyses were planned in advance (which, of course, does not preclude additional exploratory analyses that were not planned in advance).

Although the steps listed are all relatively straightforward, this does not mean that there are not challenges associated with pre-registering a validation study for a short-form creation project. One of the biggest challenges in the current example has to do with deciding how conservative to be with our thresholds of evidence. If there are relationships that are significant and fall below .25, we are saying that we will not use them as evidence for the nomological network, but does this mean they should not be interpreted at all? Certainly not – we hope that the outcomes from this and future pre-registered scale construction projects will result in more reasonable and explicit hypotheses, including more precise thresholds for meaningful effect sizes. Another related challenge has to do with what changes to make to the DIPSI-SF if our analyses tell us it is not sufficiently reliable. That is, if a 3-item facet has an alpha of less than .60, what is the best way to transparently correct for this? Should we drop this facet from the measure altogether? Most importantly, how should we go about correcting our measure if it turns out that the DIPSI-SF is sufficiently reliable, but not related to criterion variables in expected ways (e.g., Disagreeableness is not negatively associated with Agreeableness)?

As with any other measure creation study, we may be compelled to change or drop items, or to include associations that do not meet our preregistered thresholds. Although these issues would be raised in any short-form creation study, one with an associated pre-registration draws a line clearly between those results which are predicted versus exploratory, and assists authors in being more transparent about the items chosen for each subscale, rather than providing only the final version of scales with any adjustments made and not sharing any steps or corrections it took to get to that point.

Although creating a pre-registration for a short-form creation project and documenting it on the OSF may be challenging, there are also several advantages to approaching such a project in this way. First, the process of working through planned analyses and deciding on a threshold of

acceptable evidence requires authors to be thoughtful and to make only those predictions which they feel have enough empirical support. There is something about the finality of pre-registration that encourages authors to consider their hypotheses from a slightly different vantage point than they would if not made public, in the way that we are all susceptible to revising history when it is not carefully documented for others to see (e.g., “I always thought those two things would be related!”). Another benefit is that the OSF page for the project, including the pre-registration, can serve as a detailed history and documentation of every step that was taken along the way in the process, which can be useful not only to other researchers and labs, but to ourselves in the future. Documenting what did and did not work optimally in the creation of our DIPSI-SF measure will assist other research groups with deciding on best practices. As it stands now, without pre-registration and documentation of the OSF, many steps of measure/scale creation are glossed over in published assessment manuscripts, if not omitted altogether. An OSF page with greater levels of detail than a journal article can be useful in filling this gap as a “how-to” document. A final benefit to pre-registration specifically, and to using the OSF generally, is that much of the difficult work of writing up methods and results sections has already been completed. Thus, work done ahead of the analyses in the study planning and hypothesis generation phase will pay dividends in the manuscript writing phase. Overall, using the OSF to pre-register a short-form validation project has greatly improved our research process, and, in our estimation, the benefits to individual researchers and the science of psychological assessment outweigh the challenges.

Summary and Looking Ahead

Clinical psychologists have been slow to engage in field-wide efforts to improve research practices in psychological science and increase the reproducibility of our published findings (Tackett, Lilienfeld, et al. 2016). Nonetheless, this is slowly changing and we expect clinical psychological scientists will grow increasingly integrated in these ongoing efforts. Many proposals for improving

transparency and reproducibility in psychological science have been developed by and for other types of psychological research – notably, experimental studies in social and cognitive psychology. This does make the task a bit more challenging for researchers coming from other areas of psychological science (McAbee, Grubbs, & Zickar, 2018). Yet, our absence means that, not only are we missing out on the many tools and resources that have already been developed, we are not actively engaged in shaping these tools and resources to better suit our specific research areas. We urge clinical and assessment researchers to begin engaging, and contribute to the conversations and use of open science tools already available.

In this vein, we focused on one such tool—or, rather, a large collection of tools—the Open Science Framework. The OSF is an infrastructure incorporating many tools and resources to promote open, transparent, reproducible scientific research. The OSF is designed to incorporate many (perhaps even all) stages of research workflow, from planning, to execution, to reporting and archiving, to discovery (Corker & Michaelson, 2017). The first step of engaging with the OSF is to set up an account – if you don’t yet have one, do it now! Beyond that, it may feel overwhelming for those new to this platform to determine exactly how and where to get involved. Our primary goal in this manuscript was to outline some of our own initial steps in using and engaging with the OSF. In particular, the type of research we do is likely similar to that of other readers of *Psychological Assessment*, so perhaps they offer some concrete entrypoints for other, similar research labs.

It is easy and straightforward to use the OSF to post preprints of research, and preprints appear to increase the visibility of a given scientific paper. In addition, we discussed other specific examples from our lab: 1) advantages and challenges of registering a research study with archival data, 2) use of the OSF for projects involving extensive analyses/results and using extensive assessment protocols or batteries, and 3) pre-registration of scale construction efforts. Surely, these examples only scratch the surface of the types of assessment research that can and should be

incorporating OSF tools and resources. As we have embarked on this learning process, we have encountered many challenges along the way. Notably, the lack of a current community integrating open science approaches with psychological assessment research makes it harder for those of us just beginning.

In closing, it is also worth noting that the incorporation of new research tools and paradigms does not come without a cost. Many of us have difficulty finding the time to learn new tools and practices, particularly when facing an omnibus infrastructure such as the OSF. Determining where to start and finding the resources to invest in these efforts can be daunting, and even prohibitory for many (they certainly delayed our own onset into widespread use of these tools). It is certainly the case that there is an up-front resource investment—it is likely easiest to invest if one feels truly aligned with open science goals and values. In response to this concern, however, we argue that: 1) the payoff is enormous, likely greater, but perhaps less proximal and 2) as we hope we have demonstrated here, it is possible to start small and build over time. That is, ultimately, individual researchers will likely benefit greatly from the records, organization, and transparency achieved when organizing their projects on OSF. Pre-registration/registration efforts often drastically reduce the amount of effort needed at the manuscript drafting stage. And, of course, the benefits to the scientific community and literature are writ large.

Other concerns that may arise are concerns about being “scooped” (which applies to scientific research more broadly) or data sharing issues around sensitive data or copyrighted instruments (concerns particularly salient to clinical psychologists). Broader concerns are being discussed and investigated actively in the scientific community, and clinical researchers already have much to draw on in trying to understand potential consequences. In general, there is not evidence that posting open data increases the likelihood that one might be “scooped”, but rather, increases use of existing datasets and results in additional citations for the posting author. For concerns that

may be more specific to clinical psychologists (and allied fields), we will only begin navigating these areas when many researchers are actively using these tools. The important point here is that these tools are constantly evolving and open to change – not static, “one size fits all” shackles. Once users from different subdisciplines of psychology begin actively engaging with them, we will refine and develop the types of tools that work best for the type of research we do, and common applications that follow from it. As we move toward greater participation and engagement, greater community involvement, we will all benefit from working together to identify those benefits and challenges of the open science movement, and OSF resources more specifically, to improve research in psychological assessment.

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Table 1

Potential Uses of the Open Science Framework for Clinical Psychology

Potential Use	Literature review/idea generation	Study design/planning	Phase of Research		
			Data collection	Data analysis	Manuscript writing/publication
Educational and training mechanisms	X	X	X	X	X
Workflow integration tools	X	X	X	X	X
Protocol storage*		X	X		
Data storage			X	X	
Study registration		X			X
Study pre-registration		X			X
Archiving/version control	X	X		X	X
Standardized task administration*			X		
Posting full syntax*				X	
Posting detailed results					X
Detailed “how to” document/lab notebook*		X	X	X	X
Posting preprints	X				X

Note. * indicates those uses which are especially relevant for facilitating the pooling of data across studies and across laboratories, as well as for facilitating collaboration across sites. Pre-registration = document stating planned data collection procedures, hypotheses, and analyses, and hypotheses posted before data collection is undertaken; Registration = document stating planned sample selection, hypotheses, and analyses posted after data is collected (e.g., for secondary data analysis); preprint = publicly available manuscript document posted before full publication in another outlet.

Figures

Figure 1: Clinical Psychology Preprints Uploaded by Date

Data shown from first preprint posting through collection on August 29, 2017. These data include only months in which preprints were posted to the OSF.