gorical ones[3-5].

This body of evidence is shaping psychiatric thinking not via disruptive paradigm shifts, but through incremental integration. One area where this is abundantly evident is that of personality disorders (PDs). Few sections of classical diagnostic manuals have proven as problematic as that on PDs, because the vexing conceptual problems of comorbidity and within-category heterogeneity are particularly acute when conceptualizing cases in terms of classical PD categories[6]. As noted by Stein et al, "when it comes to, say, personality disorders, the disease-entity concept is even more distant, and the search for new approaches is seen as particularly key".

For these reasons, contemporary PD models in diagnostic manuals are transitioning to dimensional approaches. For example, the ICD-11 model is based on the empirical dimensional structure of PD variation, and is now officially in use[7]. Is this an example of a paradigm shift, or of incremental integration? Inasmuch as research influenced the structure of the evolving and established ICD nosological endeavor (vs. dispensing with the ICD altogether), this provides a compelling example of a much needed and welcome incremental integration. The general point is that progress does not require disruption in all instances; existing structures and mechanisms (such as the ICD revision endeavor) can often support constructive forms of progress.

Importantly, whether such progress is seen as paradigm shifting or as incremental integration may be in the eye of the beholder. For example, to maintain conformity with the international psychiatric community, the DSM's approach to PDs will need to shift toward the ICD-11 approach, which is highly similar to the DSM-5 alternative model of PDs (as opposed to the DSM-5 PD categories reprinted from DSM-IV in the categorical diagnostic section of the manual). Whether this inevitable evolution is perceived as disruptive or as incremental will depend on the perspectives of the scholars contemplating these changes. Nevertheless, the general point is that PD nosology is shifting based on evidence, within the pages of stalwart diagnostic manuals. Progress is being incrementally integrated through normal channels and is achieved without needing to dispense entirely with the ICD and DSM. Indeed, to maintain scientific viability, the ICD and DSM will need to continue to integrate dimensionality more thoroughly and not just for PDs, given the state of the extensive literature on empirical classification of psychopathology[8].

Innovations in PD classification are also beginning to impact thinking about effective approaches to intervention, through incremental integration. Sauer-Zavala et al[9] provide a compelling example of framing such approaches as transitional, via modules aimed at unpacking heterogeneity in the classical category of borderline PD. Rather than reifying this category, they embrace the heterogeneity of presentations within it, by parsing it in terms of modern dimensional approaches. They show that borderline PD heterogeneity can be effectively conceptualized by tailoring interventions to specific dimensional sub-elements, shifting treatment to more directly address the features delineated in the DSM-5 alternative model (e.g., tailoring treatment for more antagonistic vs. more disinhibited presentations). This type of perspective shows that innovation can make its way into front-line practice not by demanding abandonment of classical diagnostic labels, but by showing how modern dimensional research can help to improve case conceptualization, focusing interventions on specific presentations.

In sum, Stein et al are to be commended on a thorough and forward-thinking review of the numerous developments at the cutting edge of psychiatric research and practice. Their call to incorporate these advances is indeed welcome. Nevertheless, whether the incorporation of advances is seen as disruptive as opposed to integrative is often tied to the perspective of the observer, and the previous investments and traditions embraced by that observer. The good news is that many creative and novel ideas from the research realm are making their way into practice through normal channels, even if some are afraid that innovation may be unnecessarily disruptive.

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The future of CBT and evidence-based psychotherapies is promising

Stein et al[1] point out that, while evidence-based psychotherapies and particularly cognitive behavioral therapy (CBT) represent a "remarkable step forward", their implementation in mental health systems globally is "arguably best conceptualized as representing incremental progress".

Modest implementation is tied to several factors, including incompatibility with other psychotherapeutic models, frequent departure from evidence-based guidelines in routine care, and lack of trained clinicians. Further, even with embedded training in evidence-based therapies, as exemplified by the UK Improving Access to Psychological Therapies (IAPT) program, the authors report that rates of clinically significant improvement are estimated at only 26% when assuming poor treatment response among dropouts[1].

In line with 2004 modeling to suggest

that universal provision of evidence-based practices will reduce the global disease burden by only 40%, Stein et al[1] raise the specter that the burden of mental disorders will never be significantly reduced. In further support of this bleak outlook, they refer to the treatment-prevalence paradox of increased treatment uptake without corresponding reductions in population prevalence rates (as documented for depression).

Herein, I argue that a more promising future of CBT and other evidence-based psychotherapies is achievable through: a) more mechanistically targeted interventions, that b) are personalized or matched to individuals and c) are scaled with fidelity by harnessing technology.

The majority of randomized controlled trials (RCTs) to date evaluate CBT packages of multiple elements (e.g., cognitive restructuring, relaxation, exposure), designed for individuals classified according to diagnostic nosologies. Yet, within a set of therapeutic elements, some are likely to be more effective than others for a given individual, increasing the risk of iatrogenic effects, inefficiency, and treatment dropout. Moreover, diagnostic categorization for treatment selection ignores the substantial heterogeneity within diagnoses (e.g., within post-traumatic stress disorder, some people experience numbing and dissociation whereas others suffer from heightened emotional arousal). Transdiagnostic symptom dimension models, such as hierarchical latent structural models and symptom network approaches, promise greater precision in personalization of mental health care. Shifts towards treatment elements rather than packages, and symptom dimensions rather than diagnoses, will enable more targeted interventions that are more effectively matched to individuals. Evidence in support of prescriptive matching to specific treatment elements is beginning to emerge[2].

A treatment elements approach also aligns with targeting specific dysregulations in physiology, cognition, behavior or emotion that correlate with or contribute to psychopathology. Exemplars include advances in neuroscience and behavioral science of fear extinction, that have led to refinements of exposure therapy for fear and anxiety symptoms[3]. Corresponding advances in the area of reward processing have led to treatments that target reward hyposensitivity for anhedonia symptoms across anxiety and depressive disorders[4]. Feedback from evaluation of target engagement can then inform iterative intervention refinement.

With moderated mediation approaches, we may further learn that mediators (as measures of purported mechanisms) have differential relevance across persons. As an illustration, prediction error generalization may be a stronger driver of exposure therapy effects for some people, whereas reappraisal of feared outcomes may be more relevant for others, such that different versions of exposure therapy may be tailored for each individual. Consequently, theoretically relevant features of responding could be matched to targeted interventions more precisely and thereby more effectively, as a step beyond moderation based on standard features of clinical presentation (e.g., symptoms and functioning).

Advances in the mechanisms contributing to psychopathology, continuing development of intervention elements that specifically target mechanistic features, along with prescriptive algorithms for selecting the right intervention for a given person, represent an enormous research agenda, but one that is nonetheless underway, with the US National Institute of Mental Health's emphasis upon experimental therapeutics for clinical trials and the recent Wellcome Trust initiative of "Finding the next generation of mental health treatments and approaches".

Alongside the development of more targeted and personalized intervention elements, technologies can facilitate screening and triaging to the type of care predicted to be most effective, with rapid adaptation of care as needed, for more scalability and more effective outcomes.

Online screening and tracking of mental health status and related variables is suitable for large scale deployment, particularly adaptive testing which increases measurement precision and minimizes participant burden relative to traditional fixed length instruments[5]. Automated feedback from scoring algorithms can then guide treatment selection. Prescriptive treatment selection algorithms generated from machine learning or other modeling of an array of relevant data may improve overall outcomes relative to standard clinical decision making, as has been demonstrated when selecting between low-intensity versus high-intensity care within IAPT using a limited range of predictive variables (i.e., symptom severity, impairment, personality traits, employment status, race/ethnicity)[6]. As mentioned, theoretically relevant variables (e.g., emotion regulation, response inhibition, and threat expectancy) may enhance accuracy of treatment response prediction for specific treatment elements (versus levels of care).

Rather than adapt level of care after a patient shows non-response or prematurely discontinues treatment (as is typical in stepped care models), ongoing predictive modeling can facilitate adaptation to higher levels of care or to different therapeutic elements before failure occurs. This just-in-time treatment approach has the potential to improve effectiveness and reduce attrition, as patients may be more engaged in treatment when they are receiving what they need most at the time they most need it. Adaptive interventions can also increase the efficiency of service delivery and reduce downstream service costs. Furthermore, adaptation extends to maintenance goals, so that care can be rapidly reinitiated upon signs of symptom worsening to prevent full relapse.

Task-sharing through non-specialized providers is a cost-effective strategy for scalable mental health care[7], but is challenged by scalability of training and supervision and by fidelity assurance (adherence and competency). Digital tools can address these issues, such as training courses with interactive feedback for skill development and ongoing competency evaluations, as well as computerized session guides to maintain fidelity[8].

Digital CBT and other evidence-based psychotherapies via phone, computers and other electronic devices increase access to care, and overcome barriers of stigma, financial difficulties, time constraints, and location of services. The available evidence clearly supports their efficacy, although more research is needed in low- to middle-income countries. Digital thera-

pies are particularly suited to the research agenda of prescriptive algorithms for selecting specific intervention elements most likely to benefit an individual. Yet, user uptake, engagement and dropout are problematic, especially in routine clinical care settings. Since human support mitigates these concerns[9], models that combine non-specialist providers with digital interventions have unique potential to expand reach, engagement and effectiveness.

Mechanistically targeted and personalized intervention elements that are matched to individual needs and adapted as needs change over time, delivered digitally or by clinicians, that can be scaled up through online tools and artificial intelligence technologies, offer a future in which delivery of evidence-based care will reduce the global disease burden of mental health by more than 40%. Challenges include the enormous research agenda for developing mechanistically targeted interventions and their prescriptive matching to individuals.

Implementation will continue to be challenged by transportability of digital technologies into under-resourced areas, lack of resources for the most severely ill, and cultural adaptations to avoid simple exportation of Western constructs. Whether systems will choose to endorse evidence-based psychotherapies, in spite of the view that they are overly reductionistic or do not address complex refractory or comorbid cases, will most likely depend upon the success of that implementation.

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A path towards progress: lessons from the hard things about digital mental health

Discerning hype from hope in psychiatry remains challenging, as Stein et al[1] demonstrate in reviewing if promising perspectives and methods may launch a paradigm shift. Their conclusion that the path forward is incremental progress and iterative integration instead of a single transformative breakthrough is well argued. Perhaps nowhere else is this conclusion truer than for digital phenotyping and app-based digital mental health. Thus, focusing less on the well-known potential of these technologies, but instead on the current challenges can highlight the incremental and integrative advances Stein et al call for.

The current state of smartphone apps and digital mental health can be approached from many perspectives, but the paper published in this journal in 2019[2], promoting a consensus around evaluation, offers a very useful starting point. Briefly, the areas covered in that paper are: data privacy and safety, app effectiveness, user experience/adherence, and data integration. Considering selected examples of some of the actual hardest challenges in each of these areas can help highlight the real work towards the progress of more equitable access, appropriate regulation, and quality assurance for digital health, as noted by Stein et al. This focus on negative examples is not to detract from the true potential, but rather to identify tangible targets for necessary next steps.

Focusing first on data privacy and safety, digital mental health continues to lack trust. In March 2022, the US-based Crisis Text Line was found to be sharing users' personal text messages with a for-profit company. Days later, the same concerns were raised about a UK-based crisis text line service, Shout, highlighting the global nature of this challenge. While academic research continues to undercover many technical risks around medical app security[3], the cases of Crisis Text Line and Shout stand out, as they were legal under current regulation. They will both likely serve as the spark for regulatory changes, since patients, clinicians and the public have lost faith in self-regulation. Thus, the most important and necessary innovation for digital mental health may be identical to what it was half a decade ago – transparency and trust[4]. Legislation affording app users guaranteed protections for their data is not as flashy as cloud blockchain solutions for privacy, but it is the necessary and incremental work critical to improving the field.

The second incremental step involves proving app effectiveness. On the surface, this seems like an area of more progress compared to data privacy and safety. Today, terms such as digital therapeutics are commonly used, and regulatory agencies are granting approval or clearance to some apps. But looking beyond the hype reveals a different picture. Digital therapeutics is an industry-created term that has little grounding in either health care regulation or research. The term is actually confusing, as it is very hard to evaluate the entire evidence base for mental health apps. A 2022 systematic meta-review of 14 meta-analyses of randomized controlled trials for smartphone-based interventions failed to find convincing evidence in support of any mobile phone-based intervention on any outcome, because of the overall low quality of studies[5]. That is not to say that apps cannot