EDITORIAL: Why complexity matters in physiotherapy research

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Main Text

We talk of complexity throughout physiotherapy and rehabilitation - complex interventions, complex patients and complex conditions are all too familiar phrases in both research and practice [1]. But what does complexity mean? It may be helpful to start with a distinction – a complicated system (such as a space rocket) comprises many intricate, multi-faceted elements which behave linearly and as we would predict. Each of these constituent parts have a clearly defined and constant relationship with each other and the external context and so can be reliably replicated ad infinitum [2]. In contrast, the behaviour of a complex system is often unpredictable, non-linear and is difficult to replicate. It has many interacting elements; these elements directly influence and are influenced by each other and the wider context. Complex systems are emergent and adaptive, that is, their overall effect is greater than the sum of their parts and they change over time. This means that in a complex system it is impossible to reliably identify or predict the contribution of a single element on the overall outcome [2].

Why does this matter for physiotherapy? In clinical practice, a holistic approach has long recognised complexity – we understand that the context, belief and behaviours of both therapists and patients affect the response to any intervention we provide [3]. Yet many of our research trials do not reflect, measure or acknowledge these factors, despite them having a pivotal influence on both the effectiveness and implementation of interventions in the real-world. Research designs that search for a single effective ingredient in a restrictive context and control as many variables as possible may appear attractive [4], but they risk stifling the emergent interactions that influence the effectiveness of a complex intervention [5]. Put simply, constraining complex interventions in research means that beneficial interventions could be incorrectly judged as ineffective and vice versa. Findings of this reductive research is also likely to be difficult to implement as the controlled context in which it was conducted...
bears little resemblance to realistic practice [6]. Ultimately, attempting to reduce or control
the complexity that is inherent to many physiotherapy interventions reduces the power of
research to improve practice and results in patients being offered suboptimal care. However,
trials with little definition or control of potentially confounding variables will not generate
data that can be confidently applied to an individual patient. Clearly, embracing complexity
in our research is important but it does not mean that we should abandon controlled designs;
randomised controlled trials (RCTs) are our most powerful tool to test effectiveness and it is
to control extraneous variables when assessing efficacy. However,
understanding complexity should prompt us to contemplate different trial designs that enable
us to recognise rather than constrain complexity in our research [6].

The recent revision of the NIHR/MRC framework for the development and evaluation of
complex interventions [6] builds on an established recognition of the importance of
complexity in public health, basic science and more latterly, health research [4,7]. It is
particularly pertinent for physiotherapy researchers because, as we know, most of our
interventions can be defined as complex. The framework explicitly highlights the need to
consider the behaviour of complex systems in research, stresses the importance of context
and prioritises designs that generate clinically valuable data over those that simply seek to
minimise bias [6]. It recommends that researchers and stakeholders work together to identify
the most pressing questions that the research should address, rigorously develop the
intervention to be tested and articulate a (programme) theory that describes how an
intervention will produce an outcome. This should not only detail the effect of the
intervention on the individual but also consider complexity – that is, the wider dynamic
context that will influence, and be influenced by, an intervention. A comprehensive
programme theory also supports implementation, economic evaluation and enables changes
to be made to the intervention even during a trial [6] so that recent developments in
knowledge, practice or context can be incorporated into the interventions once a trial has
begun. This is particularly advantageous in light of how quickly practice can change in
response to internal and external influences and how slowly large clinical trials progress.
Developing this theory is vital prior to considering or conducting an evaluative trial as it
guides the decision whether to proceed to a trial and ensures that many potential problems
that would undermine evaluation are identified and proactively managed. Once it has been
decided to move to a trial, process evaluations within a RCT and novel pragmatic and critical
realist RCT designs present established methods to determine both the effects of an
intervention but also explain how these effects were created [8,9]. Novel efficient RCT
designs (e.g. master protocol trials) enable multiple treatments and people with different
clinical presentations to be evaluated simultaneously, but are not yet used widely in
rehabilitation [10]. These trials enable clinicians to understand what works, for whom and
should a trial not show significant benefit, still provides useful knowledge to inform other
research studies which reduces research waste.

In conclusion, physiotherapy practice is complex and this complexity should be reflected in
how we design and conduct research into our interventions. Now more than ever,
physiotherapy researchers have a clear mandate to undertake ambitious studies of complex
interventions that go beyond traditional reductionist designs and have the opportunity to
become recognised leaders in complexity-informed health research. This approach not only
supports high-quality research that addresses many of the key uncertainties in physiotherapy
practice but also provides a mechanism for implementation, so that effective interventions
bring benefit to patients more quickly. However, the developmental studies which are
necessary to prioritise, develop and refine complex interventions can be overlooked in favour
of evaluative trials, perhaps because complex designs are more unpredictable and are unlikely
to be easy or cheap to conduct [7]. Yet if the complex studies that are vital to advance our
practice are rejected in favour of simplistic, ‘neat’ research designs that answer easily
definable yet irrelevant questions [6] our profession and our patients will pay a significant
price. To make progress in developing effective, implementable physiotherapeutic
interventions we must conduct research using new tools designed to deal with the
complexities that are inherent to healthcare. This will enable us to answer clinically important
questions, advance our evidence-base, benefit our profession and, most importantly,
transform outcomes for our patients.

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References

behavioral medicine approach into physiotherapy clinical practice. Physiotherapy
2 [2] Sturmberg JP, Martin CM. Complexity and health - yesterday’s traditions, tomorrow’s
-2753.2009.01163.x.
Translating Evidence in complex systems (SHIFT-Evidence): simple rules to guide
Framework for the development and evaluation of complex interventions: gap analysis,
https://doi.org/10.3310/hta25570.


