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A proposed formula for rehabilitation outcomes: Programming, communication, and adherence as multiplicative determinants of goal attainment

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Abstract

Background: Rehabilitation science has produced robust models for tissue loading, therapeutic alliance, and patient adherence independently. However, no unified theoretical formula has been proposed to describe how these domains interact to determine rehabilitation outcomes. **Purpose:** This paper proposes a mathematical formula for rehabilitation outcomes — Rehabilitation Outcome = Programming × Communication × Adherence — and argues that this structure more accurately reflects clinical reality than additive or single-domain models. **Key Argument:** Drawing on established formulas in risk management and organisational change science, this paper demonstrates that each variable in the proposed formula is distinct, independently owned, and capable of nullifying the overall rehabilitation outcome when absent. Programming consists of load management and clinical decision-making. Communication describes the therapist's soft skills and therapist-client interface and its role in translating technical plans into executable action. Adherence, owned by the client, determines whether any clinical intervention produces real-world results. **Conclusion:** The Rehabilitation Formula offers clinicians a diagnostic lens to identify which variable is responsible for poor outcomes, and a conceptual framework for designing more complete, patient-centred care. Future research should focus on operationalising, validating, and create a weight for each variable within this model.

Introduction

What separates a successful rehabilitation episode from an unsuccessful one? Is it the therapist's technical skill? The quality of the exercise programme? The patient's motivation? Or is it the relationship between clinician and client that determines whether progress happens at all? Ask ten physiotherapists this question and you will receive different answers. Each defensible, each incomplete.

Rehabilitation science has developed with considerable depth in isolated domains. Load management research has given clinicians evidence-based frameworks for tissue loading and injury prevention (Dye, 2005; Gabbett, 2016). Therapeutic alliance literature has demonstrated that the quality of the clinician-patient relationship meaningfully influences outcomes (Hall et al., 2010). Behavioural science has illuminated the complex determinants of patient adherence (Jack et al., 2010; Bandura, 1997). Each domain stands on solid theoretical and empirical ground. Yet in clinical practice, these domains do not operate in silos. They interact. They depend on each other. And when one fails, the others rarely compensate. It is an interdependent model.

The field has lacked a unifying structure that captures how these domains work together. This paper proposes one.

Borrowing from the intellectual tradition of multiplicative formulas in risk and change management science, where the structural relationship between variables is as important as the variables themselves, this paper introduces the following:

Rehabilitation Outcome = Programming × Communication × Adherence.

This is not merely a conceptual metaphor. The multiplicative structure carries a specific and clinically meaningful implication: if any single variable is zero (not addressed well) the overall rehabilitation outcome would be zero, regardless of how strong the remaining

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variables are. A perfect programme delivered poorly will fail. Excellent communication around a poorly designed programme will still fail. And without patient adherence, even the most sophisticated clinical encounter cannot produce lasting results.

This paper develops the theoretical basis for this formula, defines each variable, argues for their independence and interdependence, and positions this model against existing frameworks in rehabilitation science. It is submitted as a clinical perspective, with the explicit aim of sparking both conceptual discussion and empirical investigation.

The choice of a multiplicative rather than additive structure is not arbitrary. An additive model (Outcome = Programming + Communication + Adherence) would imply that strength in one domain can compensate for weakness in another, that a highly adherent patient can offset a poorly designed programme, or that exceptional communication can rescue absent adherence. Clinical experience and the existing literature suggest otherwise. Systematic reviews of rehabilitation adherence consistently show that adherence failures produce poor outcomes regardless of programme quality (Jack et al., 2010). Equally, studies of therapeutic alliance demonstrate its independent contribution to outcomes beyond adherence alone (Hall et al., 2010). These findings are structurally consistent with a multiplicative model, where each variable must be present at a meaningful level for the others to have any effect. The multiplicative formulation is therefore proposed as the clinically more valid hypothesis, while acknowledging that empirical validation of the model's precise structure remains a priority for future research.

The Intellectual Case for Formulas in Health Science

The use of mathematical formulas to describe complex phenomena is not new. Across disciplines, researchers and practitioners have found that certain realities are best described not by listing contributing factors, but by specifying the relationship between them. Two well-established examples are worth examining before introducing the rehabilitation formula.

In risk management, the foundational formula, Risk = Probability × Severity, is deceptively simple (Lowrance, 1976). It captures something that a list of risk factors cannot: that a highly probable but trivial event carries less risk than a rare but catastrophic one. The multiplication forces a relationship. It means that reducing either variable reduces overall risk, and that an event with zero probability carries zero risk regardless of its potential severity. This structural logic has made the formula applicable across industries to mitigate risk, from aviation to healthcare safety. The same multiplicative logic has recently been applied in crisis preparedness research, where Buheji (2026) employed the R = P × S formula as the risk quantification foundation for a family resilience framework developed in the GCC context, further demonstrating the formula's cross-domain applicability.

In organisational change science, Beer's Formula for Change, which is used in Harvard Business school, Probability of Change = Dissatisfaction × Model × Process > Cost, and that this product must exceed Resistance for change to occur (Beer, 2007). Again, the multiplication carries meaning. An organisation with a clear model and a well-designed change process will still fail to change if its members are not sufficiently dissatisfied with the status quo. The formula explains why technically excellent change initiatives collapse.

Both formulas share three properties that make them intellectually durable: each variable is distinct and independently measurable; the relationship between variables is multiplicative, not additive; and the structure has diagnostic value — it tells you not just that something failed, but which element caused the failure.

The rehabilitation formula proposed in this paper is built on the same principles. It is not a metaphor. It is a structural argument about how three independently owned, clinically distinct domains interact to produce or prevent rehabilitation success. This systems-based approach is consistent with our previous work proposing the Physical Profile–Nutrition–Recovery (PNR) model, which integrates multiple interacting domains to conceptualize overall health outcomes (Khunji & Ebrahim, 2025).

The Rehabilitation Formula

The proposed formula is:

$$\textit{Rehabilitation Outcome} = \textit{Programming} \times \textit{Communication} \times \textit{Adherence}$$

Each variable belongs to a distinct domain, is owned by a distinct actor, and has a distinct failure mode. Programming is owned by the therapist's technical competence. Communication is co-owned at the interface between therapist and client, which relies heavily on the therapist soft skills. Adherence is owned by the client. Together, they represent the complete ecosystem of a rehabilitation episode.

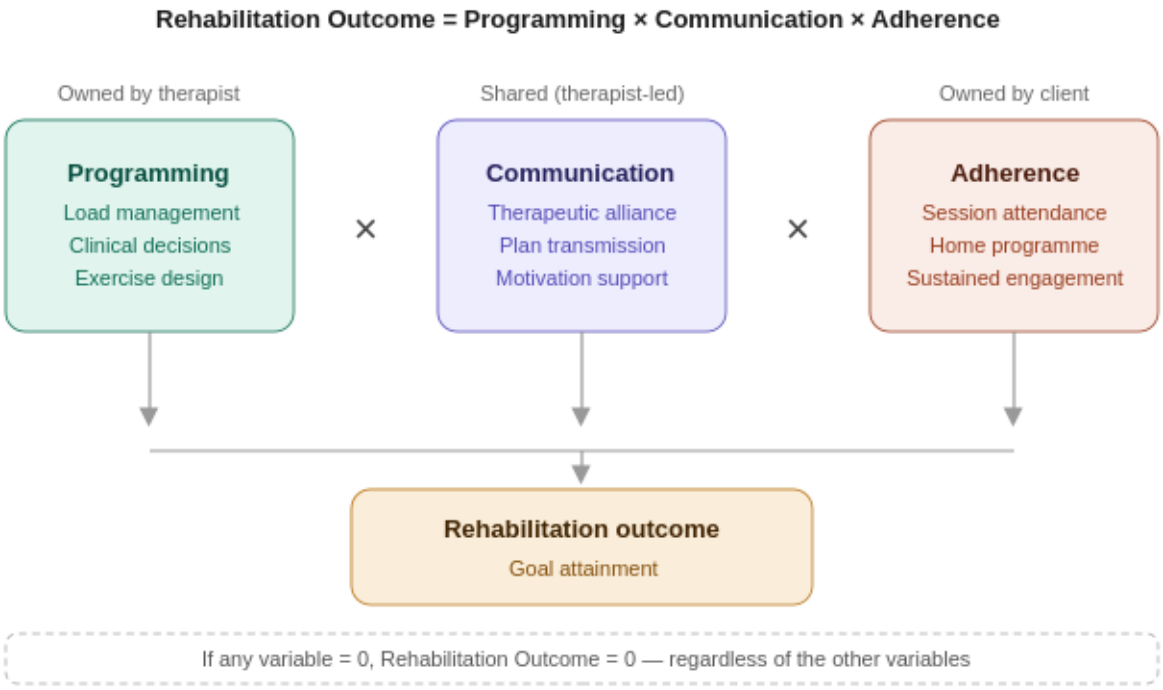

Figure 1. The Rehabilitation Formula: Programming, Communication, and Adherence as multiplicative determinants of goal attainment. A value of zero in any single variable produces a zero rehabilitation outcome, regardless of the strength of the remaining variables.

It is important to acknowledge from the outset that this is a deliberately simplified framework. Rehabilitation outcomes are influenced by many additional factors, including the patient's psychological state, socioeconomic conditions, comorbidities, pain perception, the therapist's level of experience, health literacy, environmental access to care, and social support. The three-variable model presented here does not seek to capture this full complexity. Rather, it isolates the three domains that are most directly actionable within the therapist–client encounter, and for which the multiplicative relationship carries the clearest clinical meaning. Future empirical work should examine how additional variables interact with this core structure.

It is critical to note that the output of this formula, rehabilitation outcome, is defined here as goal attainment: the degree to which the client achieves the functional objective identified at the outset of care, whether that is returning to competitive sport, resuming pain-free daily activities, or achieving any other personally meaningful movement goal (Bovend'Eerdt et al., 2009). This definition deliberately avoids reducing outcome to a single clinical metric. The benchmark for success is the client's own goal and satisfaction, assessed at intake and re-evaluated continuously throughout the rehabilitation process.

Variable One: Programming

Definition

Programming, in the context of this formula, refers to the totality of clinical decision-making that shapes the structure of a rehabilitation episode. It encompasses: exercise selection and progression, session frequency, total programme duration, volume and intensity of loading, and the application of the load-capacity model in managing tissue readiness.

The Load-Capacity Model

The most foundational concept within programming is the relationship between load and tissue capacity. A tissue (i.e tendon, muscle, bone, or cartilage) has a current capacity to tolerate mechanical stress. When applied load exceeds that capacity, tissue damage occurs. When load falls chronically below capacity, tissue adaptation stagnates. The therapeutic target is to apply load that progressively challenges tissue capacity, stimulating adaptation while avoiding re-injury.

Dye described this relationship through the concept of tissue homeostasis: the therapeutic window in which load produces adaptation rather than harm (Dye, 2005). Gabbett later formalised this in sport science through the acute-to-chronic workload ratio, demonstrating that rapid spikes in training load, not load itself, are the primary drivers of injury risk (Gabbett, 2016). For

rehabilitation clinicians, the implication is clear: programming is not simply about choosing the right exercises. It is about managing the rate of change in load over time, calibrated to the individual client's current tissue tolerance.

Programming also includes the wider structure of care: the frequency of supervised sessions per week, the duration of the rehabilitation episode, the integration of home exercise programmes, and the sequencing of clinical interventions. Poor programming even with excellent communication and high adherence will produce suboptimal or harmful results.

Programming as Therapist Responsibility

Programming is the domain where the therapist's technical competence is most visible. The therapist's knowledge of anatomy, biomechanics, pathology, and exercise science directly determines the quality of what is prescribed. It is worth emphasising, however, that even technically perfect programming cannot succeed in isolation. A precisely designed programme that is not communicated effectively will not be executed correctly. And a programme executed correctly but inconsistently will not produce the adaptations it was designed to achieve. This is why programming, however strong, multiplies rather than overrides the other variables.

Variable Two: Communication

Definition

Communication, as a variable in this formula, encompasses the full spectrum of therapist-client interaction through which the rehabilitation plan is conveyed, understood, negotiated, and sustained. It includes on-site verbal and non-verbal communication, written programme delivery (including exercise sheets, video links, and digital platforms), remote follow-up via calls or messaging, and the quality of therapeutic alliance that underpins all of the above.

The Independent Role of Communication

A question worth addressing directly: is communication simply a mechanism that produces adherence, or does it carry independent value in the formula? The answer is both and this dual function is precisely what justifies its independent position.

Communication's first function is to build trust followed by ensuring that the programme is understood and executed correctly. Even a highly motivated, fully adherent client who misunderstands their programme will perform it incorrectly, potentially producing no benefit or even causing harm. Communication bridges the gap between what the therapist intends and what the client actually does. Hall and colleagues, in a systematic review of the therapist-patient relationship in physical rehabilitation, found that the quality of the therapeutic relationship independently influenced treatment outcomes, an effect that was not fully explained by differences in adherence or programme content (Hall et al., 2010).

Communication's second function is sustaining motivation and supporting the behavioural choices that drive adherence. How a therapist frames progress, manages setbacks, and responds to the client's lived experience of their rehabilitation shapes the client's willingness to continue. This is not simply a matter of being encouraging. It involves shared decision-making, realistic expectation-setting, and the creation of a therapeutic environment in which the client feels heard and capable.

The modalities of communication matter too. In contemporary physiotherapy practice, the therapeutic encounter extends well beyond the clinic session. Written exercise programmes with embedded video demonstrations, weekly check-ins via messaging, and video call consultations for remote clients are all legitimate vehicles for the communication variable. The medium is less important than the clarity, consistency, and relational quality of what is conveyed.

Communication and the Biopsychosocial Framework

Engel's biopsychosocial model, first articulated in 1977, challenged the biomedical tradition of treating the body as a purely mechanical system (Engel, 1977). It established that psychological and social factors are not peripheral to clinical outcomes, they are part of them. Communication is the primary mechanism through which a clinician engages with the psychological and social dimensions of a patient's experience. A therapist who programmes brilliantly but communicates poorly is, in effect, operating within a purely biomedical paradigm, treating the tissue without engaging the person. The rehabilitation formula insists that this is insufficient.

Variable Three: Adherence

Definition

Adherence refers to the degree to which a client follows the prescribed rehabilitation plan across the full duration of their care episode. This includes attendance at clinic sessions, performance of home exercise programmes as prescribed, compliance with activity

modification guidance, and sustained engagement with the rehabilitation process over time.

Importantly, adherence in this formula is owned by the client. This is not to suggest that it is beyond the therapist's influence as discussed above, communication plays a significant role in shaping adherence. But the locus of behavioural action resides with the client. A therapist cannot adhere on the client's behalf. This distinction matters because it clarifies where the formula can break down despite excellent clinical input.

Why Adherence Is the Formula's Most Fragile Variable

Jack and colleagues conducted a systematic review of barriers to treatment adherence in physiotherapy outpatient settings and identified multiple independent barrier domains: pain and discomfort during exercise, competing life demands, low motivation, poor self-efficacy, insufficient social support, and inadequate understanding of the programme's purpose (Jack et al., 2010). What is striking about this list is that several barriers — self-efficacy, understanding, motivation — are directly related to therapeutic communication, while others — time constraints, pain, socioeconomic pressures — are substantially outside the therapist's control.

Bandura's construct of self-efficacy: the individual's belief in their capacity to perform a specific behaviour and achieve a desired outcome. is perhaps the most reliably documented psychological predictor of rehabilitation adherence (Bandura, 1997). Clients who believe they can complete their programme, manage their symptoms, and achieve their goals are substantially more likely to do so. Interventions that target self-efficacy, including graded task mastery, verbal encouragement, and observational learning, fall at the intersection of communication and adherence. Further illustrating why these two variables, while distinct, are deeply interdependent.

Ryan and Deci's Self-Determination Theory offers an additional lens. Behaviours that are intrinsically motivated, driven by personal values and autonomous choice rather than external pressure, are more sustainable over time (Ryan & Deci, 2000). In rehabilitation, this translates to a meaningful clinical question: does the client understand why they are doing what they are being asked to do? Have they been involved in setting their own goals? Do they experience their rehabilitation as something they are doing, rather than something being done to them? A therapist who answers yes to these questions has made a significant contribution to the adherence variable, even though they cannot own it.

Why Multiplication — Not Addition

One might argue that the three variables could be combined additively: that a strong performance in two domains could compensate for weakness in a third. This is, in fact, how many clinicians implicitly reason. A highly motivated, adherent patient will succeed despite mediocre communication. A clinician with exceptional interpersonal skills can rescue a poorly designed programme.

This paper argues that such reasoning is both clinically and practically inaccurate.

Consider three clinical scenarios:

Scenario A: A therapist designs a load-progressive programme and communicates it with exceptional clarity. The client does not follow the programme, attending one in three sessions and not compliant with performing his home exercises. What is the rehabilitation outcome? Minimal. Not reduced. Not moderate. Minimal. There is no threshold of programming excellence or communication quality that compensates for near-zero adherence.

Scenario B: A client is highly motivated and attends every session. The treating therapist has strong interpersonal skills and a warm, trusting therapeutic relationship has developed. However, the programme is poorly designed. Loading the tissue faster than it can adapt, or failing to address the functional demands of the client's goal. What is the rehabilitation outcome? Poor. Possibly harmful. High adherence to a flawed programme does not produce success; it produces consistent exposure to a flawed plan.

Scenario C: A therapist with strong technical skills and a compliant, motivated client nonetheless fails to adequately explain the programme's purpose or rationale. The client performs the exercises incorrectly because the instructions were unclear. A key progression is missed because the follow-up did not happen. What is the rehabilitation outcome? Suboptimal at best. The technical quality of the plan is undermined by its failed transmission.

These scenarios are not hypothetical. They are the most common failure patterns in physiotherapy practice based on clinical observation. The multiplicative structure of the formula captures exactly why they occur, and gives the clinician a diagnostic lens to identify which variable failed.

It is worth drawing the analogy explicitly. In the risk formula, an event with zero probability carries zero risk regardless of its severity. In the change formula, an organisation with zero dissatisfaction will not change regardless of its vision or change process. The same logic applies here: zero adherence produces zero rehabilitation outcome, regardless of programming quality or communication skill. The multiplication is not rhetorical. It is structural. Crucially, it is also diagnostic: when a rehabilitation episode fails, the formula directs the clinician to ask which variable failed — a question that an additive model does not meaningfully support.

Rehabilitation as Goal Attainment

This formula requires a clear definition of its output. What is a rehabilitation outcome?

The definition adopted in this paper is goal attainment: the degree to which the client achieves the functional objective identified and agreed upon at the outset of their care episode. This definition is deliberately broad and patient-centred. It recognises that the appropriate benchmark for one client, returning to elite competitive football, is categorically different from the appropriate benchmark for another, walking to the shops without pain.

Bovend'Eerdt, Botell, and Wade, in their framework for rehabilitation goal setting, emphasised that goals must be specific, measurable, personally meaningful, and time-bound, and that goal attainment, so defined, is a more sensitive and clinically valid measure of rehabilitation success than aggregate population-level outcomes (Bovend'Eerdt et al., 2009).

This has a direct implication for how the three variables of the formula are calibrated. Programming is not designed against a generic protocol; it is designed against the specific functional demands of the client's stated goal. Communication, unfortunately, is not generic health education; it is the transmission of a plan designed for this person, for this goal, in this context. And adherence is not measured as a population statistic; it is the degree to which this individual followed this plan toward their own goal.

Defining rehabilitation as goal attainment also humanizes the formula. It places the client's aspiration, not the therapist's protocol, at the centre of the model. This is consistent with contemporary patient-centred care principles and the direction of healthcare toward personalized medicine, and with the recognition that rehabilitation is ultimately a collaborative project between two people: one with clinical expertise, one with lived knowledge of their own body and life.

Positioning Against Existing Models

This paper does not claim that the three variables proposed here are novel discoveries. Load management, therapeutic alliance, and patient adherence are each well-established in the literature. What is proposed as novel is the structural relationship between them. Specifically, the multiplicative formulation and its diagnostic implications.

The biopsychosocial model, introduced by Engel (Engel, 1977), was a foundational intervention in rehabilitation science. It established that physical outcomes are inseparable from psychological and social context. The rehabilitation formula is compatible with this model but adds specificity: it translates the biopsychosocial framework's broad philosophical orientation into a three-variable operational structure that clinicians can actively interrogate.

The load management literature, particularly Gabbett's work on training loads (Gabbett, 2016) and Dye's tissue homeostasis model (Dye, 2005), provides the evidence base for the programming variable. This paper integrates that evidence within a larger structure rather than treating it as a standalone consideration.

The therapeutic alliance literature, including Hall and colleagues' systematic review of the therapist-patient relationship provides the evidence base for the communication variable. Again, this paper places alliance within a structural context: communication matters not only because it improves adherence, but because it has independent effects on how the programme is understood and executed.

The adherence literature, including Jack and colleagues' systematic review of adherence barriers (Jack et al., 2010) and Bandura's self-efficacy framework (Bandura, 1997), provides the evidence base for the adherence variable.

What distinguishes this formula is not its components but its architecture. By placing these three variables in a multiplicative relationship, the formula makes an argument about how they interact and that argument has consequences for how clinicians diagnose failure, design care, and evaluate outcomes.

A further consideration worth noting is whether the three variables carry equal weight within the multiplicative structure. The current formulation treats them as unweighted — that is, a value of zero in any single variable nullifies the outcome equally, regardless

of which variable is absent. This is a deliberate starting position that prioritises parsimony and clinical legibility. However, it is plausible that in specific clinical contexts, one variable exerts greater influence than the others. Chronic pain populations, for instance, may be more sensitive to deficits in communication and adherence than to programming variations, given the centrality of psychosocial factors in pain outcomes (Engel, 1977). Acute post-surgical populations, conversely, may be more programming-sensitive, where tissue load management is the primary determinant of tissue healing and re-injury risk (Gabbett, 2016). Exploring whether population-specific weighting improves the model's predictive validity is a productive avenue for future empirical work, and the present framework is intended to be flexible enough to accommodate such refinements.

Limitations and Future Directions

This paper presents a conceptual framework. It makes a theoretical argument, not an empirical one. The formula has not been validated against patient data, and the relative weighting of each variable has not been tested. Whether, in practice, deficits in one variable can be partially compensated by strength in another, and under what conditions, remains an open empirical question.

Several directions for future research suggest themselves. First, validated measurement instruments for each variable would need to be identified or developed. Programming quality could be operationalised through fidelity assessment tools and load monitoring data. Communication quality could be measured through validated therapeutic alliance scales such as the Working Alliance Inventory (Hall et al., 2010). Adherence could be measured through both objective (session attendance, accelerometry) and subjective (self-report) instruments. Once operational measures are established, prospective cohort studies could examine whether a multiplicative composite score of the three variables predicts goal attainment outcomes more accurately than scores of any single variable alone, which would constitute direct empirical support for the model's architecture. A key methodological consideration in such studies will be ensuring that the three variables are measured independently to avoid collinearity, given the functional interdependence between communication and adherence described throughout this paper.

Second, the formula may require refinement for specific clinical populations. The relative contribution of each variable is likely to differ across contexts; acute post-surgical rehabilitation may be more programming-sensitive, while chronic pain rehabilitation may be more adherence-sensitive and communication-sensitive. Population-specific versions of the formula represent a productive research direction. This further underscores the need to empirically calibrate the relative contribution of each variable.

Third, the definition of rehabilitation outcome as goal attainment, while clinically meaningful, introduces measurement complexity. Goal Attainment Scaling (GAS), as described by Bovend'Eerdt and colleagues (Bovend'Eerdt et al., 2009), provides one validated approach. Further psychometric work would be needed to ensure that goal attainment is measured consistently and comparably across studies.

Fourth, and perhaps most importantly, future research should examine whether the multiplicative structure is empirically supported or whether, in certain conditions, the additive model more accurately reflects clinical reality. This paper proposes the multiplicative relationship as the more clinically valid hypothesis. That hypothesis deserves testing.

Conclusion

Rehabilitation is not a single act. It is a sustained, collaborative process between a therapist who brings clinical expertise and a client who brings their body, their goals, and their daily life. For that process to succeed, three things must happen: the therapist must design a programme that is technically sound and load-appropriate; the therapist must communicate that programme in a way that is understood, trusted, and sustained; and the client must adhere to the plan with sufficient consistency for the intended biological and functional adaptations to occur.

These are not three nice-to-haves. They are three necessary conditions. And they interact not by adding to each other, but by multiplying. which means that the failure of any one of them diminishes the others, and the complete absence of any one of them nullifies the rest.

The Rehabilitation Formula (Rehabilitation Outcome = Programming × Communication × Adherence) offers the field a conceptual structure that is both diagnostically useful and practically actionable. When a rehabilitation episode fails, the formula asks: which variable failed? Was the programme wrong? Was the communication insufficient? Did the client not follow through? These are different problems with

different solutions, and conflating them produces generic interventions that address none of them adequately.

Formulas endure not because they are complete, but because they are structurally honest about the relationships that matter. The rehabilitation formula presented here is offered in that spirit, as a starting point for clinical reflection, empirical investigation, and a more integrated understanding of what rehabilitation is, and what it requires. It is a conceptual framework, not yet an empirically validated model. Its value at this stage lies not in predictive precision but in the clarity of the questions it asks —– and in the invitation it extends to researchers and clinicians to test, refine, and ultimately improve upon it.

Ethical Approval

Not applicable. This is a theoretical clinical perspective paper.

Author Contributions

Conceptualization: AK; Literature Search: AK, FE; Writing – Original Draft: FE; Writing – Review & Editing: AK; Visualization: FE; Supervision: AK.

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Conflicts of Interest

The authors declares no conflicts of interest.

References

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman.

Beer, M. (2007). *Leading change* (Rev. ed., Harvard Business School Background Note 488-037). Harvard Business School. https://www.hbs.edu/faculty/Pages/item.aspx?num=15708

Bovend'Eerdt, T. J., Botell, R. E., & Wade, D. T. (2009). Writing SMART rehabilitation goals and achieving goal attainment scaling: A practical guide. *Clin Rehabil*, *23*(4), 352–361. https://doi.org/10.1177/0269215508101741

Buheji, M. (2026). Building hardiness in GCC families during regional crisis: A case study during US-Israeli-Iran war (2026). *International Journal of Multidisciplinary Research and Growth Evaluation*, *7*(2), 245–257. https://doi.org/10.54660/.IJMRGE.2026.7.2.245-257

Dye, S. F. (2005). The pathophysiology of patellofemoral pain: A tissue homeostasis perspective. *Clin Orthop Relat Res*, (436), 100–110. https://doi.org/10.1097/01.blo.0000172303.74414.7d

Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science*, *196*(4286), 129–136. https://doi.org/10.1126/science.847460

Gabbett, T. J. (2016). The training-injury prevention paradox: Should athletes be training smarter and harder? *Br J Sports Med*, *50*(5), 273–280. https://doi.org/10.1136/bjsports-2015-095788

Hall, A. M., Ferreira, P. H., Maher, C. G., Latimer, J., & Ferreira, M. L. (2010). The influence of the therapist-patient relationship on treatment outcome in physical rehabilitation: A systematic review. *Phys Ther*, *90*(8), 1099–1110. https://doi.org/10.2522/ptj.20090245

Jack, K., McLean, S. M., Moffett, J. K., & Gardiner, E. (2010). Barriers to treatment adherence in physiotherapy outpatient clinics: A systematicreview. Man Ther, 15(3), 220–228. https://doi.org/10.1016/j.math.2009.12.004

Khunji, A., & Ebrahim, F. (2025). A conceptual review for optimizing physical wellness through balancing physical profile, nutrition, and recovery. *Advances in Health and Exercise*, *5*(2), 141-150.

Lowrance, W. W. (1976). *Of acceptable risk: Science and the determination of safety*. William Kaufmann.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68