

Utilizing a Psychologically Informed Approach to Physical Activity Health Promotion in Routine Physical Therapy Practice

Evidence Table & Synthesis of the Literature

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Background, Definitions, & Behavior Change

Title	Components of community rehabilitation programme for adults with chronic conditions: A systematic review
Author(s)	Hilda Mulligan, Amanda Wilkinson, Diana Chen, Carlijn Nijhof, Nicole Kwan, Ash Lindup, Sean Dalton
Year	2019
Subjects	<p>15 RCTs with low risk of bias; n=3856 (loss to follow-up= 642); age range: 42-84 years ; conditions included: arthritis (2), diabetes (3), lung disease (3), heart disease (2), stroke (1)</p> <p>Inclusion criteria: RCTs published in english from 2000 or later describing a community, group-based program for adults with 'archetypal' chronic conditions; low risk of bias</p> <p>Exclusion criteria: Mail, telephone, or internet-based programs; located in inpatient hospitals; exclusively focused on mental illness, chronic pain, infectious diseases, or cancer</p>
Outcome Measures & Timeframes	<p>Measures: 64 total throughout studies, grouped by 1) disease-specific and symptom measures, 2) self-efficacy, quality of life, and functional capacity measures, and self-management behaviors with identification of population-specific clinically relevant changes based on a minimal clinically important difference (MCID) which was identified by the authors.</p> <p>Some of the Most Common Measures across studies: 1) Dietary habits (food frequency questionnaire, healthy-eating frequency questionnaire, 3-factor eating questionnaire, food diary); 2) Healthcare utilization/ 6-month medical history; physical activity (physical activities scale, exercise behavior questionnaire, interview, fitness tracker data); 3) 6 minute walk test; 4)self- efficacy (self-efficacy for managing chronic disease scale, arthritis self-efficacy scale; 5) euroQoL (EQ-5D); 6) pain (VAS, NRS, 5 point likert); 7) mental health (hospital anxiety and depression scale); 7) fatigue,</p> <p>Included Theories: Theory of Self- Efficacy; Theory of Self- Determination</p> <p>Core Self-Management Inclusions: problem solving, decision- making, resource utilization, communication with health professionals, therapeutic-alliance, relationship building, action planning, interactive skill-learning, effective daily routine integration.</p> <p>Timeframe: 4-12 weeks (avg 7.3)</p>
Intervention(s)	<ol style="list-style-type: none"> Disease-specific education: including symptoms, medical management, and core self-management skills (problem-solving, decision-making, resource-utilization); Core Self-Management Skills Education, Explicit Skills Practice, & Regular Assessment and Feedback: communication with health care providers, developing self-management skills (self-efficacy,

	<p>decision-making, problem solving, action planning, goal-setting, monitoring of health status)- may include self-relaxation, stress-management, healthy coping</p> <p>3. Exercise: both aerobic and strength training</p>
<p>Results</p>	<ul style="list-style-type: none"> ● The Theory of Self- Determination is based upon the emphasis of a person’s ability to make decisions and set independent goals ● Program durations ranged from 4-12 weeks (avg 7.3 weeks), with 4 weeks often encompassing a strictly educational component timeframe; Session durations ranged from 1-3 hours (avg 2.4 h) □ it takes time for behavior change to occur and for self-efficacy with self-management to improve ● The most prevalent program components were: 1) education on disease and symptoms, and 2) core self-management skills, though it is not clear which specifically is <i>most</i> effective ● Goals of the programs should be focused on improving a person's confidence, awareness, and autonomy in managing their own health conditions (theory of self-determination) ● Programs which included specific and explicit exercise interventions, rather than just education on the benefits of exercise, were more effective in short and long term ● Research unequivocally demonstrates the benefits of exercise in improving physical functioning, quality of life, and in slowing the progression of chronic conditions ● Programs with the best results explicitly focused on lifestyle changes, habit-building, daily-routine integration, adherence long-term, and social support ● Exercise in group settings were more beneficial in social support and appeared to promote self-efficacy, which was linked to long-term outcomes and better adherence ● Health benefits are only maintained with adherence to a regular exercise program ● Programs including all three of the above components (explicitly) demonstrated the highest increases in patient self-efficacy and self-management outcomes ● Programs should be culturally appropriate
<p>Conclusions, Analysis, Manual Inclusions</p>	<ul style="list-style-type: none"> ● Programs should begin with a knowledge acquisition phase (patient education), include development, practice, and assessment of core self management skills, and should include an explicit and specific physical exercise component □ have been shown to significantly enhance self-efficacy & self-management outcomes ● Programs are effective when between 4-12 weeks □ behavior change takes time and follow-up. ● Focus on lifestyle change, habit building, daily routine integration

Title	Behavioral Therapy Approaches for the Management of Low Back Pain: An Up-To-Date Systematic Review https://sciwheel.com/work/item/5992837/resources/10178802/pdf
Author(s)	Vitoula, Venneri, Varassi, Paladini, Sykioti, Adewusi, Zis
Year	2018
Subjects	42 studies included in review, mean # participants: n= 90.9 (range 4-413) Inclusion criteria: Original research study (RCT, observational, case series), human adult subjects, English language, primary focus on effectiveness of behavioral therapy, involve pts with LBP
Timeframes	Timeframe: Acute- 3 studies; Subacute- 1 study; Chronic- 38 studies
Intervention(s) & Definitions	Interventions/ Types of Behavioral Therapy Included: classic behavioral therapy, cognitive behavioral therapy, third-wave approaches, contextual approaches Definitions: Behavioral therapy uses the conjunction of techniques involved in behaviorism & cognitive psychology (3 waves) First wave(original): stress management via relaxation skills, reducing maladaptive behaviors, encouraging new behaviors like problem solving and social skills training; Second wave(up to the 90s): CBT- challenging beliefs, thoughts, relies heavily on therapeutic alliance and can be done in person or via books/ learning materials; 1) knowledge & understanding of pain/perception; 2) active coping skills; 3) pain coping strategies- activity pacing, pleasant activity scheduling; 4) problem solving methods Third wave (today)- contextual therapies: focus on health promotion and wellness/ well-being , less focused on reducing psychological and emotional symptoms; includes: metacognition, acceptance, mindfulness, personal values, spirituality; ACT, MBSR Acceptance & Commitment Therapy- targets ineffective pain control strategies & experiential avoidance through acceptance of unpleasant feelings, sensations, & thoughts; development of mindfulness, value clarification, & committing to these values in ones daily lives are fundamental Mindfulness based approaches- first session- building a good relationship & determining expectations; subsequent sessions- mixture of techniques for enhancing acceptance thru graded exposure & directing attention to a present moment of focus.
Conclusion/ Analysis/	<ul style="list-style-type: none"> ● Patient expectations and health locus of control- who is responsible for their condition?- internal/ self, external/ others, or random chance; external has worst prognosis, want to encourage active coping as a personality trait- associated with better pain-related function.

Manual Inclusions	<ul style="list-style-type: none"> ● Graded exposure & graded activity for activity tolerance-decreases pain intensity, increases occupational function and return to work ● CBT combined with aerobic activity improves pain intensity sooner ● Poor sleep quality is common in people experiencing pain, but appears to be a chicken-egg scenario. One study showed poor sleep is a better predictor of disability than actual pain severity ● Depression & stress augment pain perception; de-catastrophizing is important. ● Mindfulness based approaches- several methods, including sitting & walking meditations, yoga, body scan, etc; effective at improving pain perception and function across the spectrum
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Title	Physiotherapists' perceptions of learning and implementing a biopsychosocial intervention to treat musculoskeletal pain conditions: a systematic review and metanalysis of qualitative studies https://sciwheel.com/work/item/9857275/resources/10536292/pdf https://cdn-links.lww.com/permalink/pain/a/pain_2020_01_14_holopainen_pain-d-19-00781_sdc1.pdf
Author(s)	Holopainen, Simpson, Piirainen, Karppinen, Schutze, Smith, O'Sullivan, Kent
Year	2020
Problem, Purpose & Population	<p>Problem: Most current CPGs recommend a biopsychosocial perspective when treating patients w. msk conditions- physical, psychological, social, & lifestyle factors (PIPT). Although physios report a shift towards more biopsychosocial & patient-centered approaches, training interventions do not sufficiently help them feel confident in delivering these interventions.</p> <p>Purpose: To synthesize the current evidence concerning physiotherapists' perceptions of learning & implementing a biopsychosocial intervention to treat musculoskeletal pain conditions 12 studies total, 9 RCTs, 3 mixed methods, published from 2013-2019 N=113 total PTs involved;</p> <p>Patient populations included in study: 7 LBP, 2 knee OA, 1 chronic pain, 1 RA, 1 WAD</p>
Methods & Timeframes	<p>Inclusion criteria: English, peer-reviewed, included PTs who had undergone training w/ a biopsychosocial approach and had started implementing it in practice to treat MSK conditions; explored learning & implementing biopsychosocial interventions targeting both physical & psychosocial factors, underpinned by an active PT intervention. For mixed methods studies, only the qualitative analysis was included if performed. Exclusion</p>

	<p>criteria: not related to training intervention, no psychological or cognitive training component, no application of biopsychosocial approach in practice, not a qualitative study, not discussing PT views on training/ implementation</p> <p>Timeframes: 1 acute, 4 chronic, otherwise unspecified</p>
Intervention(s)	<p>PT Training History Dosage: 10-150 hrs total;</p> <p>Training Methodologies: CBT, acceptance-commitment therapy, stress-inoculation training, person-centered practice, behavioral change techniques, graded activity, CFT, & the STarT Back approach</p>
Thematic Analysis & Identified Barriers	<p><u>Thematic Analysis: (See Appendix For More Information)</u></p> <ul style="list-style-type: none"> ● Changed understanding & Practice: biopsychosocial understanding & application, person-centered care, enhanced therapeutic alliance & communication, wider application of new skills ● Professional benefits: increased confidence as a result of new skills, effective practice, increased job satisfaction; reports of increased confidence with managing musculoskeletal pain and patients with more complex health problems, which allowed a better management of service constraints, such as lack of time (addresses commonly reported barrier- lack of time); reported an improved efficiency, faster discharge times, more efficient caseload management, & helping patients access appropriate treatments more quickly ● Clinical challenges: discomfort when dealing with psychosocial factors, consideration of professional role, resistance/ questioning of new approach, overwhelmed by amount of new information, difficulty changing practices, patient's beliefs & expectations, time constraints ● Learning requirements: structured learning, diverse learning methods during workshops, ongoing process, support <p><u>Barriers:</u> lack of knowledge, time constraints, traditional expectations, training, confidence</p> <ul style="list-style-type: none"> ● A commonly mentioned concern is that we are not doing PT anymore, because it is not PT in the traditional sense of the work when such a large portion of time is spent talking to patients, rather than doing something to them. ● Patient expectations: not every patient wants this, and you have to choose or be able to change the patient's mind. The patient might think "well I didn't really come in here to have my thinking challenged or changed, I just came to get the exercises"
Learning Requirements, Proposed Strategies &	<p><i>Adequate training and individualized mentoring related to psychosocial factors:</i> Training in biopsychosocial approaches often involves and necessitates a change in PT attitudes & beliefs and many programs are often underdosed to provide an adequate stimulus for change requires extensive training.</p>

Manual Inclusions	<ul style="list-style-type: none"> ● Should be taught early in a PT’s career, before they have time to develop a different way of practice □ aim this at DPT programs, new grads, residency programs, etc ● Include both the evidence-based support for the intervention AND practice of the skill/ intervention ● Provide resources for further study ● Incorporation of structured protocols to follow ● What’s the adequate training dosage? 100+ hours of didactic, experiential, & supervised learning ● Behavior change theories should be used, but it is unclear which are most effective ● Utilize many methods of support: recording oneself and reviewing/ reflecting, receiving feedback, working with pilot patients, small group meetings, facilitated discussion, mentorship from a psychologist ● Emphasis on not needing to do everything w/ every patient. Like any skill-set, the real skill & experience comes from being able to pick & choose what is helpful and weave it into care. ● Discussion of role boundaries- give a description and examples of overstepping boundaries <p><i>Suggested Solutions to Changing or Dealing with Patient Expectations:</i></p> <ul style="list-style-type: none"> ● Changing public expectations about physiotherapy, combining psychological components with usual PT management, providing individual patient education on the program’s purpose ● Use multiple different patient resources to promote the new approach (print, website, resources, handouts)- anything to increase exposure to the information to encourage attitude and belief change <p><i>Suggested Solutions-Time Constraint:</i></p> <ul style="list-style-type: none"> ● Longer eval time slot, phone f/u, apps to allow tracking & feedback ● More skills practice to improve efficiency
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Title	A Model to Integrate Health Promotion and Wellness in Physical Therapist Practice: Development and Validation ¹ https://academic.oup.com/ptj/article/97/12/1169/4101241 Appendix C
Author(s)	Donald H Lein Jr, Diane Clark, Cecilia Graham, Patricia Perez, David Morris
Year	2017
Purpose	<i>Purpose:</i> to develop and validate the Health-Focused Physical Therapy Model (HFPTM).

Methods & Evaluation	Step: 1) model development via investigative team consensus based on expertise & knowledge of relevant literature & health behavior theory; 2) model refinement & consensus via interdisciplinary team of experts in health promotion; 3) content validation via Delphi process by PT experts in field of health promotion and wellness Model refinement (step 2) occurred via World Café format with aims to elicit feedback of the model, determine lifestyle behavioral management strategies perceived to be within the scope of PT practice, & define lifestyle behaviors that required referral to other health care professionals for management
Barriers to Health Promotion	Significant challenges: lack of reimbursement for health promotion & wellness, may increase challenges for liability and legal issues, lack of credibility that PTs can help with a specific condition (stress, nutrition); nutrition offers especially complex area (esp in NC d/t practice act)
Results & Suggestions	<ul style="list-style-type: none"> ● Need to identify triggers for referral to other professionals ● PTs may need enhanced communication skills to practice health promotion effectively ● PTs should develop a consultative network for easy referral back & forth, including health services and programs as referral sources ● Have many patient educational materials on hand <p>Sleep Hygiene:</p> <ol style="list-style-type: none"> 1. Identify psychosocial issues interfering with sleep, refer accordingly if needed 2. Address positioning & consider equipment needs (mattress, pillows) <p>Stress Management:</p> <ol style="list-style-type: none"> 1. Clear role for increasing PA for stress management & prescribing relaxation exercise 2. Need to understand difference between different types of mental health professionals (counselors, psychologists, psychiatrists) and refer appropriately <p>Substance Abuse:</p> <ol style="list-style-type: none"> 1. Threshold for referral should be set low
Conclusions, Manual Inclusions	<ul style="list-style-type: none"> ● Questions related to reimbursement? Legal concerns? Page describing advice or current reimbursement. NC PT scope. ● Screening tools and other “triggers” for referral ● Page with links to various pt educational materials (US guide to PA and nutrition? OA guidelines? Pain neuroscience education links, etc) ● Page with list of: psychosocial issues interfering with sleep, providers to refer to, advice

	<ul style="list-style-type: none"> • Page outlining role of PA in stress management, example of relaxation exercises, referrals, etc • Referral sources/ networks □ page with blanks to help ppl fill in their own network, find providers in their areas; including community based programs, etc • Page describing what various types of providers do, <i>who</i> to refer to (psychologist, social worker, psychiatrist, registered dietitian vs nutritionist?, athletic trainer, OT, SLP, chiro?- any and all included in the referral page) • Page for ppl to fill in referral sources for their practice population?: Psychologists (sleep? Sport? Stress?), registered dietitians, behavioral health, PAs, OT, community-based programs, social worker, personal trainers & specialty personal trainers, etc- All may not be applicable to all settings
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Title	Population Health, Prevention, Health Promotion, and Wellness Competencies in Physical Therapist Professional Education: Results of a Modified Delphi Study https://academic.oup.com/ptj/article-abstract/100/9/1645/5818362?redirectedFrom=fulltext
Author(s)	Dawn M Magnusson, Zachary D Rethorn, Elissa H Bradford, Jessica Maxwell, Mary Sue Ingman, Todd E Davenport, Janet R Bezner
Year	2020
Purpose, Design, Population	Purpose: to establish consensus-based competencies for population health, prevention, health promotion, & wellness (PHPW) that entry-level DPTs should possess Design: 3-round modified Delphi study; Panel of N= 37 experts including PTs from various practice settings and geographic locations assessed relevance & clarity of 34 original competencies
Criteria	2 criteria to establish consensus: 1) median score of 4 (very relevant) of 5 pt Likert scale; 2)80% of participants perceiving competency as very or extremely relevant
Results	25 competencies achieved final consensus in 3 broad domains: 1) Preventive services & health promotion (n=18) 2) Foundations of population health (n=4) 3) Health systems & policy (n=3)
Conclusion/ Manual Inclusions:	“Adoption of the competencies would promote consistency across PT education programs. Developing these competencies is critical as we as PTs seek to contribute to ameliorating the burden of chronic disease in the population, and as we aim to transform society to improve the human experience.” See Appendix E

	<p>I viewed and attended a presentation at CSM this year based upon these competencies and the preceding and succeeding research, titled: ED-6502 - Integrating Population Health, Disease Prevention, and Health Promotion Competencies Within Physical Therapist Professional Education Programs. In the session, speakers described learning objectives and assignments used in their own program to help students meet these competencies, for example the development of a community health program, participation or volunteering in a community health program or community outreach events, and eating at the poverty level (\$5/day for 3 consecutive days). Identification of potential community resources, partners, etc to find out more about the community they are in (looking at green spaces, liquor stores, other resources, and health outcomes in certain areas)</p>
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Title	Promoting Health and Wellness: Implications for Physical Therapist Practice (Perspective/Narrative Review) https://academic.oup.com/ptj/article/95/10/1433/2686492
Author(s)	Janet R. Bezner
Year	2015
Definitions	<p>“Health promotion refers to “the process of enabling people to increase control over, and to improve, their health. The concept of health promotion moves beyond a focus on individual behavior, toward a wide range of social and environmental interventions.” -APTA</p> <p><i>Social cognitive theory</i>- central tenet is self-efficacy, found to have clinical utility & be effective when used by PTs</p>
Specific Skills for PA promotion	<ul style="list-style-type: none"> ● Ability to ask the question “Are you physically active?” and provide guidance when the answer is “no” ● Personal experience with physical activity; role modeling ● Screening for physical activity ● Exercise prescription ● Counseling skills, including skill in motivational interviewing ● Time management (ie, fitting regular physical activity into daily lifestyle)
PA-promoting approaches	<ul style="list-style-type: none"> ● Educate patients and clients about the health benefits of physical activity. ● Make patients and clients aware of the current recommended minimum guidelines for physical activity ● Explore perceived barriers to physical activity. ● Promote self-efficacy for exercise. ● Encourage goal setting and monitoring outcomes. ● Include strategies for helping patients and clients to prevent relapse.

	<ul style="list-style-type: none"> ● Build social support.
Manual Inclusions	<ul style="list-style-type: none"> ● Physical activity or health promotional items presented as “a means to an end” ● Use of questionnaires- Perceived Wellness Survey ● Physical Activity as a tool for: general health, to promote and support smoking cessation, to enhance sleep, to manage stress (including t'ai chi & yoga) ● “Supported by unequivocal evidence of its positive effects, physical activity appears to be the most important & effective intervention PTs can incorporate into every patient/client plan of care to promote health and wellness ● Don’t just encourage people to be more active, encourage them to be “less sedentary” □ “Stand Up, Sit Less, Move More, More Often” ● Time management & fitting PA into daily life ● Role modeling healthy habits ● Stress management & relaxation techniques: deep breathing, progressive muscle relaxation, visualization, meditation, autogenic training, biofeedback, massage ● Info on how to promote each other area of health promotion is provided in this article (smoking cessation, nutrition counseling, stress, & sleep ● Motivational interviewing as a client-centered intervention which is useful in developing motivation to change a health behavior when one is resistant ● Ecological Approach: people wanting to become more physically active may not have a safe place to do so (barrier) □ identification of community resources or alternatives <p>Note: this article has extensive lists of barriers & opportunities and supports that PTs should be looking to fill the gaps in their knowledge surrounding health promotion & wellness and should work to build provider networks for more coordinated care</p>

Title	Physical Therapy 2.0: Leveraging Social Media to Engage Patients in Rehabilitation and Health Promotion (Perspective) https://academic.oup.com/ptj/article/95/3/389/2686555
Authors	Emily Knight, Robert J. Werstine, Diane M. Rasmussen-Pennington, Deborah Fitzsimmons, Robert J. Petrella
Year	2015
Results/ Clinical Utility	<ul style="list-style-type: none"> ● Images displaying positive emotions are more likely to be viewed ● Positive reinforcement through social media can lead to more views & more user engagement

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| | <ul style="list-style-type: none">● Individuals decision to share content with others based on happier emotions elicited, impressions aroused, and perceived utility● Patients with chronic conditions are more likely to seek out information via collaborative sites (wikis), but it's hard to determine whether this site is actually credible, even though they may perceive it as so● Social medias are usually free, accessible, and user-friendly● Legality and ethics must be considered● Use permission forms from patients, include them in intake forms for social media <input type="checkbox"/> more positive reinforcement |
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Developing a Health Promotion Program Plan of Care

The Theory of Self-Determination is based upon the emphasis of a person's ability to make decisions and set independent goals. Interventions aimed at self-management should be culturally appropriate and should include education, self-management skill development, and regular assessment and feedback (self and external feedback) on progress and performance. According to Mulligan et al,² the goal of a health promotional program should be to guide healthy behavior changes, such as increasing physical activity (our focus), improving sleep hygiene, stress management, and eating habits, and encouraging cessation of smoking or of use of other substances. Program should emphasize self-efficacy with self-management, and should aim to improve a person's confidence, competence, and autonomy in managing their own health condition(s).

Authors² suggest that personal health literacy is essential for independent health-decision making and effective, value-based goal setting. Programs for patients with chronic conditions can be effective when they are 4-12 weeks and begin with a knowledge acquisition stage that includes both disease-specific education and health-focused education, as this establishes foundational knowledge which is essential for developing successful core self-management skills. The program should further include the development and explicit practice of core self-management strategies, such as problem-solving, independent health decision-making, resource utilization, goal-setting, action planning, and effective communication strategies with health care providers. Finally, programs should include an intentional and explicit physical exercise component, not just education on why exercise is beneficial, as programs that do so demonstrate significantly better outcomes both short and long term. Programs with these key components are supported by the evidence to significantly enhance self-efficacy and self-management outcomes.

If developing material for social media or for advertisement or patient education purposes, Knight et al³ indicate that images displaying positive emotions are more likely to be viewed and that positive reinforcement through social media can lead to more views and user engagement. One should be sure to use permission forms from patients, which can be included with intake forms, for

social media use. People with chronic conditions appear more likely to seek out information via collaborative sites, such as wikis, and it is hard to determine whether these sites are credible. One other potential strategy you could implement would be to find credible wikis for a variety of health-related conditions or issues and have them on a resource page you can offer to patients. One could also develop a page of credible Instagram, twitter, or Facebook pages and health-related phone applications as a patient resource or on your website.

Health Behavior Change & Psychologically Informed PT Practice (PIPT)

Health behavior change is the foundation of health promotion and wellness. Physical therapists and other health professions commonly derive methodologies from other professions to help us to better deliver specific interventions or to better treat our patients. To encourage health behavior change, we can consider the various types of behavioral therapies and their underlying methodologies, well summarized by Vitoula et al.⁴ Traditional cognitive behavioral therapy (CBT) focuses on identifying and changing dysfunctional thoughts, feelings, beliefs, and behaviors. Third wave CBT approaches, also referred to as contextual approaches, consider not the behaviors themselves that people display, but how they respond to challenging situations or contexts, and how they experience and respond to internal sensations and emotions. It considers the intimately interconnected physical, psychological, and spiritual facets that together equate to an individual that is greater than the sum of their parts, and focuses on striving for the most satisfying, meaningful, and healthy life possible. Contextual CBT considers things like metacognition, acceptance, mindfulness, personal values, and spirituality, and focuses on enhancing health and well-being, rather than just ameliorating pain or eliminating symptoms of problems.

Some examples of different contextual approaches include Acceptance and Commitment Therapy (ACT) and Mindfulness-Based Stress Reduction. ACT is action-oriented and focuses on accepting one's current experience rather than avoiding, denying, or further

struggling with them, and on identifying and committing to one's values. ACT utilizes strategies such as graded exposure, mindfulness practice, and value-based goal setting, and is useful for targeting ineffective and maladaptive coping strategies and experiential avoidance. Mindfulness-based approaches aim to enhance acceptance of one's experience by directing attention to a present moment of focus and utilize a variety of strategies such as sitting and walking meditations, mind-body therapies such as yoga or tai-chi, diaphragmatic breathing, and visualization, among others.

Current Training & Practice

Most current CPGs recommend a biopsychosocial perspective when treating patients with musculoskeletal conditions, through consideration of the various physical, psychological, social, and lifestyle factors a patient may experience. Although there has been a general shift towards more biopsychosocial and patient-centered approaches, current training interventions are insufficient for PTs to be comfortable with delivering these types of interventions.⁵ Rethorn et al⁶ note that in a recent sample of outpatient PTs from the academy of orthopedic PT and geriatric section (n=552 individuals), only 12% reportedly regularly promote physical activity in their practice.

Results of a systematic review with meta-synthesis⁵ of perceptions of PTs who had undergone additional biopsychosocial-focused trainings identified 4 key themes associated with the training, including:

- 1. Changed Understanding & Practice:** leading to enhanced therapeutic alliance, improved person-centered care, and wider application of new skills, especially communication
- 2. Professional benefits:** including increased self-efficacy, increased job satisfaction, more efficient caseload management, faster discharge times, and overall better management of service constraints

- 3. Learning requirements:** significant and meaningful changes require extensive and ongoing didactic, experiential, and supervised instruction. Training most beneficial when many learning formats were provided, including workshops, manuals, practice sessions, mentorship, role playing, etc
- 4. Clinical challenges:** remaining discomfort when dealing with psychosocial factors, conflict and confusion over professional role, resistance & questioning of new approach by self or others, difficulty with changing and sustaining new style of practice, traditional patient's beliefs & expectations, time constraints, and reimbursement

Training in biopsychosocial approaches often involves and necessitates a change in attitudes & beliefs, and most programs are currently underdosed to provide an adequate stimulus for change. True psychologically informed physical therapy (PIPT) practice is a result of extensive training and experience, with formal training including 100-200+ hours of didactic, experiential, and supervised learning with both clinical psychologists and experienced PTs, and ongoing training throughout one's career to keep skillset effective. Its inclusion within and as adjunct to routine PT care and with regard to health promotion and wellness has been found to be effective at improving outcomes related to self-efficacy, self-management, perceived disability, fear avoidance beliefs, and overall mental and physical health and well-being in the short and long term with moderate to large effect sizes (results of CAT).

Barriers to a Holistic Approach

Several barriers to this methodology are commonly reported. Lack of training is the foremost barrier to a holistic approach. Additionally a perceived lack of knowledge or competence with delivering these types of interventions, traditional patient and employer expectations, time and reimbursement-related constraints, and confusion over role boundaries all contribute to the challenges. A common misconception when discussing a 'psychologically-informed' practice style is that we are overstepping our role as PTs and trying to play the role of a psychologist, this is false. We are not aiming to treat someone with a clinical mental health

disorder, we are using theories based in human behavior change to more effectively deliver our own interventions and to promote improved health and wellbeing of our patients. Focusing on health promotion may further present challenges related to liability and legality. For example, if we were to give nutrition advice outside of general guidelines, we would be out of our scope of practice in North Carolina. Further, we as a profession often lack credibility to patients with regard to our ability to help with management of specific conditions or in specific areas (sleep, physical activity promotion, stress management, etc); however, as part of the health care team, PTs should be aware of holistic issues as a way to determine whether referral for psychological care is warranted. We can utilize outcome measures such as the Beck Depression inventory, the PHQ-9, or the OSPRO Yellow Flag Questionnaire to help us to screen and make this determination.

Integrating these strategies within routine practice through longer evaluation session time blocks (45 minutes to an hour), multiple methods of patient education, efficient use of screening tools, structured follow ups, strong referral networks to providers and community resources, and overall communication style differences can ameliorate many of these aforementioned barriers by improving efficiency of care. Ongoing skills practice and continuing education can further help to improve efficacy and efficiency, and can be accomplished through recording oneself and reflecting on performance, role playing with other providers, small group meetings, facilitated discussions, formal mentorship from experienced PTs or psychologists, and participation in established continuing education programs or classes.

Health Promotion & Wellness

The American Physical Therapy Association (APTA) defines *health promotion* as “the process of enabling people to increase control over, and to improve, their health” and states that “the concept of health promotion moves beyond a focus on individual behavior towards a wide range of social and environmental interventions.” Social Cognitive Theory is one common model of behavior change,

emphasizing self-efficacy, that has been found to have good clinical utility and to be effective when utilized by PTs. A recent effort to promote consistency across PT education programs related to topics of Population Health, Prevention, Health Promotion, and Wellness⁷ resulted in 25 established competencies across 3 major domains: 1) Preventative Services and Health Promotion, 2) Foundations of Population Health, and 3) Health Systems & Policy. These competencies are critical for providing the foundational tools PTs need to help ameliorate the burden of chronic disease in the population. For a full list of these competencies, see Appendix D.

Physical Activity Health Promotion

The health promotional focus of this project, specifically, is on increasing physical activity. Supported by unequivocal evidence of its positive effects, physical activity appears to be the most important and effective intervention PTs can incorporate into every patient/client plan of care to promote health and wellness.⁸ Like any health promotional domain, the promotion of physical activity is a means to an end. Physical activity, specifically, is a useful tool which is effective at improving general health, enhancing sleep, managing stress, and as an adjunct support to smoking cessation and recovery from other forms of substance abuse. Rethorn et al⁶ note that in a recent sample of outpatient PTs from the academy of orthopedic PT and geriatric section (n=552 individuals), only 12% reportedly regularly promote physical activity in their practice through screening and direct health promotion behaviors, such as through patient education on guidelines, integration into PT goals, following up about increasing activity levels, or other behaviors.

Janet Bezner is one researcher who has contributed significantly to the body of research on the promotion of health and wellness in PT practice and was one of the authors of the newly established competencies mentioned above. In a 2015 narrative review,⁸ she outlined specific skills and approaches within each of the 5 main domains of health promotion, including physical activity.

Specific skills needed for the effective promotion of physical activity begin with one's ability to routinely ask the question, "Are you physically active?" Other skills include: personal experience with physical activity, role modeling of healthy behaviors, the ability to screen for physical activity levels, proficiency with exercise prescription, counseling skills (such as motivational interviewing), and time management in order to fit PA into one's daily routine. Rethorn et al⁶ also note that the individual PT's level of physical activity in their own life predicted physical activity promotion in their practice, which further supports Bezner's⁸ point that PT's should be role models for their patients for the behaviors they wish to promote.

Approaches to promoting physical activity to patients include education on the benefits of PA, education on current recommended guidelines for PA, exploration of perceived barriers to PA, promoting self-efficacy for exercise, encouraging goal-setting and tracking of progress, inclusion of strategies to help prevent relapse, and the use of social supports to improve accountability. Through the lens of an ecological approach, we can also recognize that people wanting to become more physically active may not always have a safe place to do so, and so can see the necessity of identifying community resources or other alternatives to be more inclusive and improve accessibility for our clients. We should not just be encouraging people to be more active, but to be less sedentary. In the words of Bezner, we should advise our patients to: "Stand Up, Sit Less, Move More, More Often."

Physical Activity:

Title	Physical Activity Promotion Attitudes and Practices Among Outpatient Physical Therapists: Results of a National Survey
Author(s)	Zachary Rethorn, Kyle Covington, Chad Cook, Janet Bezner
Year	2021
Purpose/ Population/ Methods	Sample of OP US PTs from the academy of orthopedic PT and APTA geriatrics completed an online survey re: PA promotion in practice & contributing factors (Classified as regular or irregular) N=552 individuals, 393 surveys included in analysis
Results	<ul style="list-style-type: none"> ● 58.5% irregularly promoted PA ● Only 12% reported regularly promoting PA ● PT PA level predicts PA promotion in their practice ● Levels of PA promotion were similar across all age ranges
Conclusion/ Analysis:	<p>Conclusion: despite guidance from national and international governing bodies, few OP PTs promote PA to patients</p> <p>Integrating pathways to screen for baseline PA may improve rates of PA promotion</p> <p>Physical Activity Vital Sign- proposed & validated use would also allow for a method to avoid overuse, allow for improved efficiency and resource</p> <p>Getting around the reimbursement barrier providing concurrent promotional strategies, weaving it into</p>

Title	When Adults Don't Exercise: Behavioral Strategies to Increase Physical Activity in Sedentary Middle-Aged and Older Adults https://sciwheel.com/work/item/5745287/resources/9595427/pdf
Author(s)	ME Lachman, L Lipsitz, J Lubben, C Castaneda-Sceppa, LM Jette
Year	2018
Purpose/ Population	<p>Purpose: to consider the use of effective, low-cost, multicomponent motivational and behavioral strategies for increasing physical activity, which could have far-reaching benefits at the individual and population levels</p> <p>Population: sedentary middle-aged & older adults at risk of health problems</p>
Background, Definitions	People know that PA is important & healthy so why don't they do it? very low levels of motivation and/or failures of self-regulation & control

	<p>Barriers to regular PA: limited free time, fear of falling or getting injured, cost, transportation, pain, lack of enjoyment; in the US, especially in cities, there are less opportunities to incorporate PA into daily routines because everyone drives, takes escalators, etc</p> <p>Benefits of PA: widespread evidence exists supporting those more physically active enjoy better physical, psychological, and cognitive health, are more productive, able to work longer, more socially engaged, and have an overall better quality of life</p>
<p>Intervention(s) & results</p>	<p>Personalized approach to motivation & behavior change: social support, goal-setting, positive affect, coupled with cognitive restructuring of negative & self-defeating attitudes misconceptions; these strategies lead to increases in exercise self-efficacy and beliefs, self-management skills (self-regulation, action planning) leading to long-term increases in PA</p> <p>Changes in Activity Frequency & Intensity of PA improvements in physical & psychological well-being (in older adults, including those from underserved, vulnerable populations (social determinants))</p> <p>Even modest increases in PA can have a significant impact on health & quality of life</p>
<p>Conclusion/ Analysis/ manual inclusions:</p>	<p>Patient & Clinician Buy-in short phrases & research:</p> <ul style="list-style-type: none"> ● PA is beneficial for psychological well-being, cognitive functioning, and physical health (clinician & pt buy-in phrase) ● Even modest changes can significantly improve health and quality of life ● Maintaining PA throughout life is an important public health objective ● Low levels of PA have been called a global pandemic & is cited as one of the leading causes of death ● Personalized approach using low-cost behavioral strategies to encourage an active lifestyle & to achieve long-lasting behavior change among those at risk for poor health <p>Other Points:</p> <ul style="list-style-type: none"> ● Those with lower socioeconomic status & minority groups are at greater risk of developing chronic conditions and disproportionately affected, so should be targeted <p>Strategies to implement in daily routines:</p> <ul style="list-style-type: none"> ● Park farther away in the parking lots ● Schedule a time slot for a daily walk. Do it around meals for the effect on blood sugar fluctuations (postprandial blood glucose) https://caloriesproper.com/the-power-of-a-good-walk/

Title	Increasing Recreational Physical Activity in Patients With Chronic Low Back Pain: A Pragmatic Controlled Clinical Trial https://www.jospt.org/doi/10.2519/jospt.2017.7057 https://www.jospt.org/doi/pdf/10.2519/jospt.2017.7057
Author(s)	Noa Ben-Ami, Gabriel Chodick, Yigal Mirovsky, Tamar Pincus, Yair Shapiro
Year	2017
Level of Evidence	2b: multicenter, prospective, controlled clinical trial
Purpose/ Population	<p>Purpose: to test the effectiveness of an enhanced transtheoretical model intervention (ETMI) aimed at increasing recreational PA in population: patients with chronic LBP in comparison to usual PT</p> <p>N= 220 pts referred to PT for chronic LBP</p> <p>Inclusion criteria: aged 25-55 years, chronic LBP duration > 3 months with or w/o radiation to lower limb, referred to Maccabi Healthcare services PT clinics.</p> <p>Exclusion criteria: patients with rheumatic diseases, tumors, fractures, fibromyalgia, previous spinal surgery, pregnancy, LBP after care or work accidents, & those w/ language difficulties</p>
Outcome Measures	<p>Primary Outcome: back-pain related disability (Roland- Morris disability questionnaire- RMDQ)</p> <p>Secondary Outcomes: pain intensity, mental & physical health (SF-12), and levels of PA</p>
Intervention(s) & Definitions	<p>Interventions:</p> <ul style="list-style-type: none"> ● Treatment: Enhanced transtheoretical model intervention (ETMI)-delivered by PTs, based on behavior change principles, combined w/ increased reassurance, therapeutic alliance, & exposure to reduce fear-avoidance, targeting known obstacles to engaging in PA (see Appendix E). Tailored to an individual's cognitive readiness for change. Previous systematic review of 57 behavior-change interventions in mixed populations w/ health problems suggested this approach may be effective ● Controls: routine PT <p>Training of PTs: see appendix E for full info</p> <ul style="list-style-type: none"> ● Practicing 4+ years; modalities not allowed, manual therapy not allowed ● Allowed to use own discretion for assigning interventions ● 1 PT per patient ● All attended a 1-day course on 'good clinical practice' ● Main obstacles to PA □ tried to match to specific intervention components: <ul style="list-style-type: none"> ○ low motivation □ motivational interviewing ○ low self-efficacy in reference to PA □ education & pt handouts

	<ul style="list-style-type: none"> ○ fear of movement □ in vivo exposure & graded activity <p><u>Definitions:</u></p> <ul style="list-style-type: none"> ● Transtheoretical Model (TTM): primary guiding principle of intervention; premise of approach is to match the intervention to the patients’ cognitive readiness to change (stage) by increasing their self-efficacy. ● Enhanced TTM Intervention: also includes enhanced reassurance, patient education, and addressing fear of movement <p><u>Stages of Change:</u></p> <ul style="list-style-type: none"> ● Precontemplation- unwillingness or reluctance ● Contemplation- willingness to discuss, don’t plan to change in the next 6 months ● Action- had engaged in activity at least 3x/wk on a regular basis for less than 6 months ● Maintenance- Had engaged in activity at least 3x/wk for longer than 6 months
Results	<ul style="list-style-type: none"> ● ETMI group demonstrated: significantly lower disability (mean change from baseline between interventions was 2.7 pts on RMDQ) ● Short term improvements- significant improvements in recreational PA (mean 3.5 sessions) ● Long-term improvements(12 months)- pain intensity, physical health, & PA levels (ETMI)
Conclusion/ Analysis/ Manual Inclusions:	<p>Utility: this study excluded pts that are often the main focus of other studies looking at behavior change- arthritis, surgical populations, etc. This allows us to expand the scope of these behavior change intervention types to include a more expansive umbrella of patients.</p> <p>Conclusion: Targeting obstacles to PA w/ interventions that include components to address self-efficacy and fear-avoidance are more effective than routine PT in reducing long-term disability</p> <p><u>Inclusions for Manual:</u></p> <ul style="list-style-type: none"> ● Recreational PA □ chosen over prescribed exercise d/t low adherence & no evidence on one particular type being more effective than others; base on pt preference & motivation and WHO recommendations (30 min mod-intensity aerobic PA/day □ “can speak but not sing”) ● Advise pt on how to self-monitor and self-manage pain/sxs ● Emphasize PA as treatment & prevention tool for pain/sxs; clear messages about effectiveness of PA ● Pt handouts & resources for self-management <p><u>Training Content:</u></p>

	<ol style="list-style-type: none"> 1) Communication skills 2) Detection of stages of change & matching to intervention 3) Use of motivational interviewing questioning in reference to PA self-efficacy: <ol style="list-style-type: none"> a. come up w/ some example statements about effectiveness of PA in decreasing & preventing pain/injury/flare, role in stress management & wellbeing, etc 4) Using exposure to address fear of walking <p><i>Training Modalities:</i> role play, observation, giving & receiving feedback, multiple choice test, fidelity</p>
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Title	Healthy Eating, Physical Activity, and Sleep Hygiene (HEPAS) as the Winning Triad for Sustaining Physical and Mental Health in Patients at Risk for or with Neuropsychiatric Disorders: Considerations for Clinical Practice
Author(s)	Matteo Briguglio, Jacopo Antonino Vitale, Roberta Galentino, Giuseppe Banfi, Carlotta Zanaboni Dina, Alberto Bona, Giancarlo Panzica, Mauro Porta, Bernardo Dell’Osso, and Ira David Glick
Year	2020
Article Type	Overview of the current evidence in relation to the Healthy Eating, Physical Activity, and Sleep Hygiene (HEPAS) components in the prevention and management of neuropsychiatric disorders with suggested guidance for clinical practice
Physical Activity-overview of physiology & associations	<ul style="list-style-type: none"> ● “Until recently, all of us were athletes.” We evolved as hunter gatherers with high levels of daily physical activity. This level of activity is the state in which our motor systems, spatial navigation, memory, executive functions (decision making, planning, control of attentional systems) developed. ● The more physical activity we participate in, the more the branching of blood capillaries and pruning of neuronal cells. ● Active lifestyles increase the antioxidant capacity, boosts immune system, and renders the body less vulnerable to both disease and cognitive decline ● Common cellular pathways or neurogenesis and plasticity appear synergistically promoted by physical exercise and food components ● The less a person moves, the more they appear to be exposed to a higher risk of anxiety and depressive disorders, cognitive decline, and dementia.

Physical activity- overview of existing methods	<ul style="list-style-type: none"> ● Sedentary behaviors exist on a hierarchy with screen behaviors associated with some of the highest distress so promote more non-screen activities, especially those with more cognitive demands like reading, doing puzzles, or sitting and talking outside ● Monitoring- ask about activity trackers to gauge step count, average resting HR, activity levels, sleep, etc! ● Reliable questionnaires for PA – general physical activity questionnaire (GPAQ) available in many languages ● Health.gov guidelines ● Physical Activity as an Active Lifestyle- park farther away, get off public transportation a few stops before, plan active hangouts with friends, dog walks, etc. Social support is great for accountability ● Incremental Progress
Other tools	<p>MyPlate app, website, handouts Appendix for summary chart</p>

Why Don't Adults Exercise?

Maintaining physical activity throughout life is an important public health objective. Low levels of physical activity have been called a 'global health pandemic' and is cited as one of the leading causes of death worldwide. Widespread evidence exists supporting those more physically active enjoy better physical, psychological, and cognitive health, are more productive, able to work longer, more socially engaged, and have an overall better quality of life, yet people still do not participate in it. This may be in part due to very low levels of motivation and/or failures of self-regulation and control. Other key barriers to participating in regular physical activity, including limited free time, fear of falling or getting injured, cost, transportation, pain, and lack of enjoyment. In the US, especially in cities, there are less opportunities to incorporate PA into daily routines because everyone drives, parks close, and takes the escalators. Minority groups and those experiencing a lower socioeconomic status are at greater risk of developing chronic conditions and disproportionately affected, so should be targeted by our health promotion interventions to help facilitate lifestyle change and accessibility. Interventions aimed to increase activity frequency and intensity in older adults, including those in underserved or vulnerable populations, resulted in significant improvements in measures of physical and psychological well-being.

Lachman et al⁹ support the use of a personalized approach to motivation and behavior change through emphases on enhancing social support, utilization of value-based goal setting, and effective communication with positive reinforcement are key approaches to utilize when trying to increase levels of PA. These approaches, coupled with cognitive restructuring of negative and self-defeating attitudes and misconceptions resulted in significantly increased exercise self-efficacy, positive health beliefs, improved self-management skills, and long-term (1+ years) increases in physical activity levels. This personalized approach with use of simple behavioral strategies is a low-cost approach to promoting a more active lifestyle, and is effective at helping achieve long-lasting behavior change among those at risk for poor health. Additionally, it is well supported and should be emphasized that even modest positive changes in physical activity can improve physical and mental health, and overall quality of life.

Ben-Ami et al¹⁰ found that an intervention program to promote physical activity using an enhanced transtheoretical model, which includes positive reinforcement, an emphasis on patient education, and which addresses fear of movement, was more effective than routine care in improving measures of perceived disability in patients with low back pain. Those receiving the enhanced approach demonstrated significant improvements in recreational PA within 3-4 sessions, and demonstrated significantly better outcomes in pain intensity, physical health, and levels of PA at 1 year follow-up compared to those receiving routine PT care. The foundation of this intervention process was the ability to match the barriers to PA and contributing psychosocial factors to interventions. Stages of Change were described as follows:

Stages of Change:

- **Precontemplation**- unwillingness or reluctance
- **Contemplation**- willingness to discuss, don't plan to change in the next 6 months
- **Action**- had engaged in activity at least 3x/wk on a regular basis for less than 6 months
- **Maintenance**- Had engaged in activity at least 3x/wk for longer than 6 months

Intervention Matching was accomplished as seen below. For example:

- Main obstacles to PA + Stage of Change □ Specific Intervention Components:
 - Low Motivation or Precontemplation/Contemplation Stage □ Motivational Interviewing
 - Low Self-Efficacy in Reference to PA □ Education & Patient Handouts
 - Fear of Movement □ In-vivo Exposure & Graded Activity

Promoting recreational PA may better promote adherence over prescribed exercises since it can be better catered to patient preference and motivation. Emphasizing PA as both an explicit treatment and a prevention tool for pain or symptom exacerbation,

with clear messages about its effectiveness, is additionally important for adherence. We should advise patients how to self-monitor and self-manage pain or other symptoms, and how to grade appropriately so as to avoid overuse-related injuries. This can be accomplished through adjunct patient education handouts or other resources for self-management.

Specific Strategies:

Title	The Effect of Replacing Sitting With Standing on Cardiovascular Risk Factors: A Systematic Review and Meta-analysis (https://pubmed.ncbi.nlm.nih.gov/33367205/)
Author(s)	Farzane Saeidifard, Jose R Medina-Inojosa, Marta Supervia, Thomas P Olson, Virend K Somers, Larry J Prokop, Gorazd B Stokin, Francisco Lopez-Jimenez
Year	2020
Subjects	<p>Purpose: to investigate effect of replacing sitting with standing on cardiovascular risk factors in healthy adults 9 clinical trials, 8 RCTs, 1 nonrandomized N= 877 participants (565 women) mean age 45 +/-5</p> <p>Inclusion criteria: (1) Design: published and unpublished experiments with a parallel randomized or nonrandomized comparison group or crossover clinical trials. (2) Participants: nonpregnant and nonlactating healthy adults. (3) Intervention: replacing sitting time with standing for at least 30 minutes per day. (4) Comparison: sitting without any significant break including standing or walking. (5) Outcome: changes in CVD risk factors, including obesity measures (weight, WC, waist to hip ratio, and BFM), cardiometabolic biomarkers (fasting blood glucose (FBG), fasting insulin (FI), and lipids), and systemic blood pressure. (6) Follow-up: a minimum of 5 consecutive days.</p>
Outcome Measures & Timeframes	<p>Measures: fasting blood glucose, fasting insulin, lipid levels, blood pressure, body fat mass, weight, and weight circumference</p> <p>Timeframe: mean follow up time= 3.8 months</p>
Intervention(s)	<ul style="list-style-type: none"> Replacing sitting with standing, mean between groups difference 1.33 hours/day VS control group
Results/ Conclusion/ Manual Inclusions	<ul style="list-style-type: none"> Replacing sitting with standing results in very small but significant ($p < 0.05$) decreases in fasting blood glucose levels (-2.53 mg/dL [-4.27 to -0.79]) and body fat mass (-0.75 [-0.91 to -0.59 kg]) No significant change note for fasting insulin levels, lipid levels, BP, weight, or waist circumference In the US, the average monitored sitting time is about 7.7 hours per day (equal to 54.9% of waking hours)

Title	Combined effects of continuous exercise and intermittent active interruptions to prolonged sitting on postprandial glucose, insulin, and triglycerides in adults with obesity: a randomized crossover trial https://pubmed.ncbi.nlm.nih.gov/33308235/
Author(s)	Michael J Wheeler, Daniel J Green, Ester Cerin, Kathryn A Ellis, Ilkka Heinonen, Jaye Lewis, Louise H Naylor, Neale Cohen, Robyn Larsen, Paddy C Dempsey, Bronwyn A Kingwell, Neville Owen, David W Dunstan
Year	2020
Subjects	Population: Sedentary adults who were overweight to obese n = 67 ; mean age 67 yr \pm 7; BMI 31.2 kg·m ⁻² \pm 4.1
Outcome Measures & Timeframes	Controlled via standardized meals, blood samples at 13 time points Measures: postprandial glucose, insulin, and triglycerides
Intervention(s)	<ul style="list-style-type: none"> ● three conditions: 1) SIT (control): uninterrupted sitting (8-h); 2) EX+SIT: sitting (1-h), moderate-intensity walking (30-min), uninterrupted sitting (6.5-h); 3) EX+BR: sitting (1-h), moderate-intensity walking (30-min), sitting interrupted every 30-min with 3-min of light-intensity walking (6.5 h).
Results	<ul style="list-style-type: none"> ● Compared to SIT, EX+SIT increased total area under the curve (tAUC) for glucose by 2% [0.1-4.1%] and EX+BR by 3% [0.6-4.7%] (all p < 0.05). ● Compared to SIT, EX+SIT reduced insulin and insulin:glucose ratio tAUC by 18% [11-22%] and 21% [8-33%], respectively; and EX+BR reduced values by 25% [19-31%] and 28% [15-38%], respectively (all p < 0.001) ● Compared to SIT, EX+BR reduced triglyceride tAUC by 6% [1-10%] (p = 0.01 vs SIT), and compared to EX+SIT, EX+BR reduced this value by 5% [0.1-8.8%] (p = 0.047 vs EX+SIT) ● magnitude reduction in insulin tAUC from SIT(control)-to-EX+BR was greater in those with increased basal insulin resistance. No reduction in triglyceride tAUC from SIT-to-EX+BR was apparent in those with high fasting triglycerides.
Conclusion/ Analysis/ Manual Inclusions:	<ul style="list-style-type: none"> ● Postprandial glucose, insulin, & triglyceride metabolism is impaired by prolonged sitting and enhanced by exercise. ● Additional reductions in postprandial insulin-glucose dynamics & triglycerides may be achieved by combining exercise with breaks in sitting, particularly in those with high basal insulin resistance ● Those with high fasting triglycerides may be resistant to such intervention-induced reductions in triglycerides

Title	The effects of prolonged sitting, prolonged standing, and activity breaks on vascular function, and postprandial glucose and insulin responses: A randomised crossover trial https://pubmed.ncbi.nlm.nih.gov/33395691/ (2021)
Author(s)	Meredith C Peddie, Chris Kessell, Tom Bergen, Travis D Gibbons, Holly A Campbell, James D Cotter, Nancy J Rehrer, Kate N Thomas
Year	2021
Purpose, Subjects	Purpose: to compare acute effects of prolonged sitting, prolonged standing and sitting interrupted with regular activity breaks on vascular function and postprandial glucose metabolism. Design: randomized cross-over trial, n=18 adults
Measures & Timeframes	<ul style="list-style-type: none"> Flow mediated dilation (FMD) was measured in the popliteal artery at baseline and 6 h. Popliteal artery hemodynamics, and postprandial plasma glucose and insulin were measured over 6 h.
Intervention(s)	Prolonged sitting= control; regular activity breaks; prolonged standing
Results	<ul style="list-style-type: none"> Regular Activity Breaks increased blood flow 80% and net shear rate 72% compared to control(both p = 0.001) at 60 min. These differences were then maintained for the entire 6 h. Prolonged Standing increased blood flow at 60 min only (overall effect of intervention p<0.001; difference = 62%; 95% CI 28 to 97%; p = 0.001). Regular Activity Breaks decreased insulin incremental area under the curve (iAUC) when compared to both Prolonged Sitting (overall effect of intervention P = 0.001; difference = 28%) and Prolonged Standing (difference = 19%; p = 0.015).
Conclusion/ Analysis/ Manual Inclusions:	<ul style="list-style-type: none"> Normal-weight participants (18 adults) Regular activity breaks induce significant improvements in blood flow, shear stress, & postprandial metabolism that are associated with beneficial adaptations PA & sedentary behavior messages to clinicians & patients should focus more on the importance of frequent movement rather than just replacing sitting & standing (2 minutes of walking every 30 minutes)

Title	Breaking prolonged sitting reduces postprandial glycemia in healthy, normal-weight adults: a randomized crossover trial https://pubmed.ncbi.nlm.nih.gov/23803893/ (2013)
Author(s)	Meredith C Peddie, Julia L Bone, Nancy J Rehrer, C Murray Skeaff, Andrew R Gray, Tracy L Perry
Year	2013

Subjects	Purpose: Compare the effects of prolonged sitting, continuous physical activity combined with prolonged sitting, and regular activity breaks on postprandial metabolism. N=70 sedentary adults
Measures & Timeframes	Measures: postprandial glucose metabolism taken over 9 hours
Intervention(s)	<ol style="list-style-type: none"> 1) prolonged sitting intervention involved sitting for 9 h 2) physical activity intervention involved walking for 30 min and then sitting 3) the regular-activity-break intervention involved walking for 1 min 40 s every 30 min.
Results	<ul style="list-style-type: none"> ● Regular activity breaks lowered values by 866.7 IU compared to sitting & 542.0 IU compared to physical activity ● Regular activity breaks lowered values by 18.9 mmol plasma glucose compared to sitting & 17.4 mmol compared to PA ● Physical activity lowered triglyceride values by 6.3 mmol compared to regular activity breaks
Conclusion/ Analysis/ Manual Inclusions:	<ul style="list-style-type: none"> ● 70 healthy, normal weight adults ● Regular activity breaks (1 min 40 secs walking every 30 min) more effective than continuous PA at decreasing postprandial glycemia & insulinemia (P<0.0001) ● Plasma triglycerides- continuous PA more effective than regular activity breaks at reducing plasma triglyceride levels (p<.006)

Title	Systematic review of the prospective association of daily step counts with risk of mortality, cardiovascular disease, and dysglycemia https://pubmed.ncbi.nlm.nih.gov/32563261/
Author(s)	Katherine S Hall, Eric T Hyde, David R Bassett, Susan A Carlson, Mercedes R Carnethon, Ulf Ekelund, Kelly R Evenson, Deborah A Galuska, William E Kraus, I-Min Lee, Charles E Matthews, John D Omura, Amanda E Paluch, William I Thomas, Janet E Fulton
Year	2020
Subjects	<p>N=17 prospective studies</p> <p>Inclusion criteria: longitudinal design with health outcomes assessed at baseline and subsequent timepoints; defining steps per day as the exposure; reporting all-cause mortality, CVD morbidity or mortality, and/or dysglycemia outcomes; adults ≥18 years old; and non-patient populations.</p> <p>Exclusion criteria:</p>

Measures & Timeframes	Measures: accelerometry, pedometer to assessing daily step count & associations w/ all cause mortality, CVD morbidity or mortality, and dysglycemia (diabetes incidence, insulin sensitivity, fasting glucose, HbA1c)
Results	<ul style="list-style-type: none"> ● Each 1000 daily step count increase from baseline resulted in risk reduction in all-cause mortality (6-36%) and CVD (5-21%) over 4-10 years or 5-21 % of each over 2-5 years. No evidence of interaction by age, sex, health conditions, or behaviors (alcohol use, smoking status, diet) ● Shape of dose response relationship is unclear but benefits occur well below the 10,000 step threshold
Conclusion/ Manual Inclusions:	Incremental changes are beneficial. Even making a goal for an extra 1000 steps a day is a beneficial goal and has been shown to result in significant risk reductions in all-cause mortality and CVD-morbidity and mortality, regardless of age, sex, health condition, or other health behaviors (alcohol use, smoking, poor diet)

“Stand Up, Sit Less, Move More, Move Often”

“Until recently, all of us were athletes.” We evolved as hunter gatherers with high levels of daily physical activity. This level of activity is the state in which our motor systems, spatial navigation, memory, executive functions (decision making, planning, control of attentional systems) developed. The more physical activity we participate in, the more the branching of blood capillaries and pruning of neuronal cells. Active lifestyles increase the antioxidant capacity, boosts the immune system, and renders the body less vulnerable to both disease and cognitive decline, as common cellular pathways for neurogenesis and plasticity appear synergistically promoted by physical exercise. Conversely, the less a person moves, the more they appear to be exposed to a higher risk of anxiety and depressive disorders, cognitive decline, and dementia. Sedentary behaviors exist on a hierarchy, with screen time behaviors (ex: social media, video games, etc associated with some of the highest distress. Even if someone is resistant to exercise, we should promote switching to more non-screen activities, especially those with more cognitive demands like reading, doing puzzles, or sitting and talking outside. Any incremental changes have the potential to result in significant improvements in mental and physical health and well-being.

Even modest changes can significantly improve health and quality of life for patients. We should focus more on the importance of frequent movement rather than just replacing sitting and standing¹¹ in both normal weight and obese populations. Frequent, brief activity breaks from sitting or standing have significant effects on postprandial glucose and insulin metabolism, and on vascular function.^{12,13} Activity breaks can also be a much more manageable and much less daunting change than the addition of intense or prolonged PA, and are a feasible option even in those with time constraints. In healthy adults, regular activity breaks have actually been found to be *more* effective than one continuous bout of PA at decreasing postprandial glycemia and insulinemia ($P < 0.0001$); however, continuous PA is still most effective if the aim is to lower triglycerides, particularly if a person has high levels of fasted triglycerides.^{13,14} Additional reductions in postprandial insulin-glucose dynamics and triglycerides may be achieved by combining

regular exercise with frequent breaks from sitting, particularly in those with high basal insulin resistance. Thus, even 1-2 moderate intensity walks of 15-30 minutes a day, especially around meal times, and frequent 1-3 minute activity breaks every 30 minutes are effective strategies for significantly improving insulin and glucose metabolism and lowering triglycerides, thus reducing the risk and effects of metabolic diseases such as diabetes mellitus type II.

Further emphasizing the benefits of incremental increases in physical activity levels, Hall et al¹⁵ note that even increasing one's daily step count by 1,000 steps has been shown to result in significant risk reductions in all-cause mortality and CVD-morbidity and mortality, regardless of age, sex, health condition, or other health behaviors like alcohol use, smoking, or poor diet. A dose-response relationship does exist between increases in daily step count and the aforementioned measures of morbidity and mortality, but the overall shape of this curve is unclear; however, the research does suggest that benefits occur well below the 10,000 step/day threshold commonly cited. For each increase of 1,000 steps per day from baseline, there is a significant risk reduction in all-cause mortality of 6-36% and CVD related morbidity and mortality of 5-21% over about 4 to 10 years. This remains significant within as little as 2-5 years with an overall risk reduction of about 5-21% for all-cause mortality and ~5% for CVD-related morbidity or mortality.

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