

Whole Systems Research: Researching the Way We Practice



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Whole Systems Research in Health Care: A Scoping Review



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REVIEW ARTICLE

Whole Systems Research Methods in Health Care: A Scoping Review

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Abstract

Objectives: This scoping review evaluates two decades of methodological advances made by “whole systems research” (WSR) pioneers in the fields of traditional, complementary, and integrative medicine (TCIM). Rooted in critiques of the classical randomized controlled trial (RCT)’s suitability for evaluating holistic, complex TCIM interventions, WSR centralizes the principle of “model validity,” representing a “fit” between research design and therapeutic paradigm.

Design: In consultation with field experts, 41 clinical research exemplars were selected for review from across 13 TCIM disciplines, with the aim of mapping the range and methodological characteristics of WSR studies. Using an analytic charting approach, these studies’ primary and secondary features are characterized with reference to three focal areas: research method, intervention design, and outcome assessment.

Results: The reviewed WSR exemplars investigate a wide range of multimodal and multicomponent TCIM interventions, typified by wellness-oriented, multitarget, and multimodal therapeutic aims. Most studies include a behavioral focus, at times in multidisciplinary or team-based contexts. Treatments are variously individualized, often with reference to “dual” (biomedical and paradigm-specific) diagnoses. Prospective and retrospective study designs substantially reflect established biomedical research methods. Pragmatic, randomized, open label comparative effectiveness designs with “usual care” comparators are most widely used, at times with factorial treatment arms. Only two studies adopt a double-blind, placebo-controlled RCT format. Some cohort-based controlled trials engage nonrandomized allocation strategies (e.g., matched controls, preference-based assignment, and minimization); other key designs include single-cohort pre-post studies, modified n-of-1 series, case series, case report, and ethnography. Mixed methods designs (i.e., qualitative research and economic evaluations) are evident in about one-third of exemplars. Primary and secondary outcomes are predominantly assessed, at multiple intervals, through patient-reported measures for symptom severity, quality of life/wellness, and/or treatment satisfaction; some studies concurrently evaluate objective outcomes.

Conclusions: Aligned with trends emphasizing “fit-for-purpose” research designs to study the “real-world” effectiveness of complex, personalized clinical interventions, WSR has emerged as a maturing scholarly discipline. The field is distinguished by its patient-centered subgeneric focus and engagement with nonbiomedical diagnostic and treatment frameworks. The rigorous pursuit of model validity may be further advanced by emphasizing complex analytic models, paradigm-specific outcome assessment, inter-rater reliability, and ethnographically informed designs. Policy makers and funders seeking to support best practices in TCIM research may refer to this review as a key resource.

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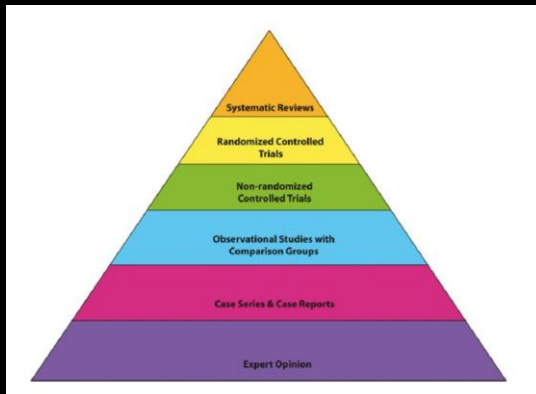
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Methodological Dissonance?

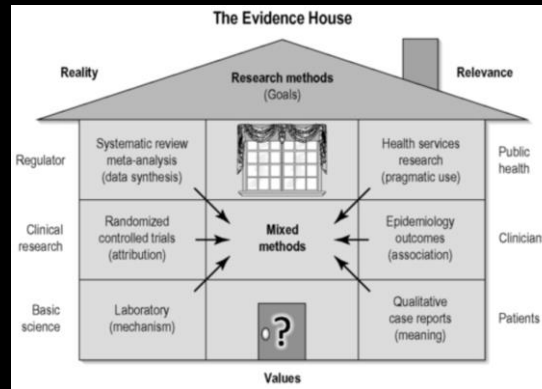
	Biomedicine (Classical RCT)	TCIM Interventions (Typical)
FOCUS	Disease	Patient (multimorbidity)
	Symptom management	Balance / health restoration
DIAGNOSTICS	Biomedical	Paradigm specific +/- biomedical
INTERVENTION	Singular / isolated	Complex / multimodal
	Standardized / static	Individualized / tailored / dynamic
OUTCOMES	Objective biomarkers	Subjective, holistic assessment
	Single endpoint	Progressive tracking
TRAJECTORY	Evidence precedes practice	Practice precedes evidence
PLACEBO DESIGN	Inert control	Often active / non-credible placebos
RESEARCH PRIORITY	Efficacy / mechanism of action	Real world effectiveness
RESEARCH AIMS	Explain effects and validate best practices	Evaluate marginal therapies to foster health systems integration

Adapted from Ijaz et al 2019

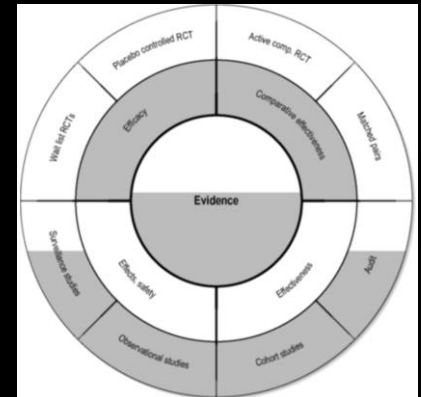
Competing Models of Evidence



Golden SH, Bass EB 2013.
Diabetes Care 36(10):3369.



"Evidence House" - Jonas 2001



"Circular Model" - adapted from
Walach et al 2006

Model Validity



A good fit between
research design,
the studied intervention, and
the underlying paradigm.

WSR Scoping Review Overview

- **Aim:** To map the *range* of clinical research features pertaining to model validity principle
 - Study design
 - Intervention selection
 - Outcome measures
- **Initial Process:** Expert consultative process + supplemental searches
- **Inclusion criteria**
 - *Completed peer-reviewed studies* reporting TCIM clinical outcomes
 - *Focus on model validity including minimum two of the following:*
 - a) complex intervention; b) individualized care; c) salutogenic / behavioral focus; d) multimorbid patients; e) dual diagnosis.



WSR Exemplars (n=41)

Study size range:

1 – 3000 patients

Study duration range:

1 day to several years

Thirteen disciplines represented:

- Anthroposophy
- Ayurveda
- Chinese medicine
- Chiropractic
- Complementary/integrative medicine
- Energy medicine
- Homeopathy
- Naturopathy
- Midwifery
- Preventive/restorative biomedicine
- Swedish massage
- T'ai chi
- Yoga therapy

Areas of clinical focus include:

- Acute and chronic illness (including arthritis, cancer cardiovascular, diabetes, headache, insomnia, tinnitus)
- Mental health concerns
- Musculoskeletal disorders
- Reproductive conditions
- Medically unexplained symptoms
- Quality of life
- Prevention and rehabilitation

Most Common Study Designs

- **Pragmatic comparative effectiveness trials**
 - *Whole systems (WS) intervention vs. Usual care*
 - *Usual care + WS intervention vs. Usual care*
 - *Factorial designs*
 - E.g. acupuncture vs acupuncture plus herbal medicine
 - *Mixed methods* (qualitative methods, economic evaluations)
 - *Allocation*: Mainly randomized but some 'pragmatic'
 - Patient preference, matched pairs (EMR)
 - *Open label*: virtually no double blinding
 - *Active controls* rather than placebo/sham
- **Pre-post observational studies (single arm)**
- **N-of-1 series**
- **Retrospective designs**

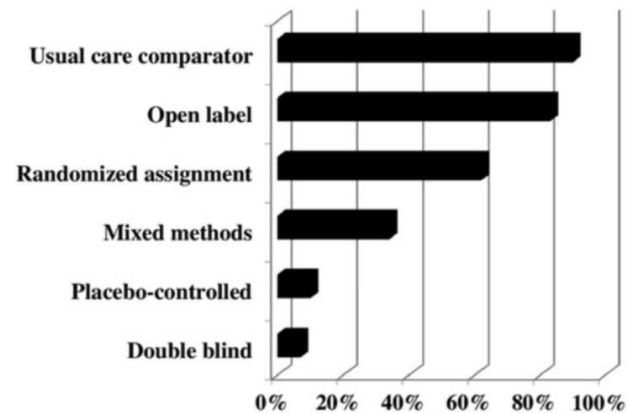


FIG. 5. Controlled/comparative whole systems research designs.

Individualization Spectrum



FIG. 2. Spectrum of clinical individualization strategies.

Dual Diagnosis

A Pilot Whole Systems Clinical Trial of Traditional Chinese Medicine and Naturopathic Medicine for the Treatment of Temporomandibular Disorders

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APPENDIX 1. TRADITIONAL CHINESE MEDICINE PROTOCOL

Syndrome diagnosis	Points	Base herbal formula(s)	Symptoms	Points
Liver qi stagnation	GB41, GB40, GB34, LV14, LV13	<i>Xiao yao san</i> or <i>chai ju shu gan tang</i>	Headache	GV20, taiyang, GB41, ST41, TW5
Liver blood xu	GB39, BL18, BL20	<i>Jia wei si wu tang</i>	Insomnia	HT7 or PC6, anmian
Liver yin xu	SP6	<i>Yi guan jian</i>	Ear pain	TW3, TW17
Liver Wind, liver yang, or liver Fire rising	LV2, GB40	<i>Zheng gan xi feng tang</i> or <i>tianma gouteng yin</i>	Fibromyalgia	SP21, scalp points: upper, middle, and lower jiao
Qi and blood stagnation due to injury	Ah shi	<i>Xiao huo luo dan</i> or <i>tong qiao huo xue tang</i>	Depression and/or anxiety	GV24, GV20, CV17, CV12, CV6
Heart blood xu	BL15	<i>Tian wang bu xin dan</i> , <i>zhi gan cao tang</i> , <i>sheng mai san</i> , <i>gan mai da zao tang</i> or <i>ding zhi wan</i>	Neck/shoulder pain or tightness	BL43, BL12, SI3
Spleen qi xu and Damp retention	ST36, SP9	<i>Bu zhong yi qi tang</i> , <i>shen ling bai zhu san</i> , <i>jiu jun zi tang</i> , or <i>wu ling san</i>	Low back pain	BL23, shiqizhui, BL40
Kidney qi xu	BL23, KD3	<i>Jin gui shen qi tang</i>	Difficulty moving the jaw	During last 5 minutes remove all local points and stimulate LI4 while patient attempts to move her jaw
Kidney jing xu	BL52	<i>Zuo gui yin</i>		
Kidney yin xu	SP6, KD6	<i>Zhi dai di huang tang</i> , or <i>liu wei di huang tang</i>		
Kidney yang xu	GV4, CV4	<i>You gui wan</i>		
Wind-Cold invasion	TW5	<i>Juan bi tang</i> , <i>Yi yi ren tang</i> , or <i>Gui zhi wu tou tang</i>		

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EDUCATION
 TREATMENT
 ADVOCACY



Available online at www.pain.org and www.sciencedirect.com

Comparative Effectiveness of Traditional Chinese Medicine and Psychosocial Care in the Treatment of Temporomandibular Disorders—Associated Chronic Facial Pain

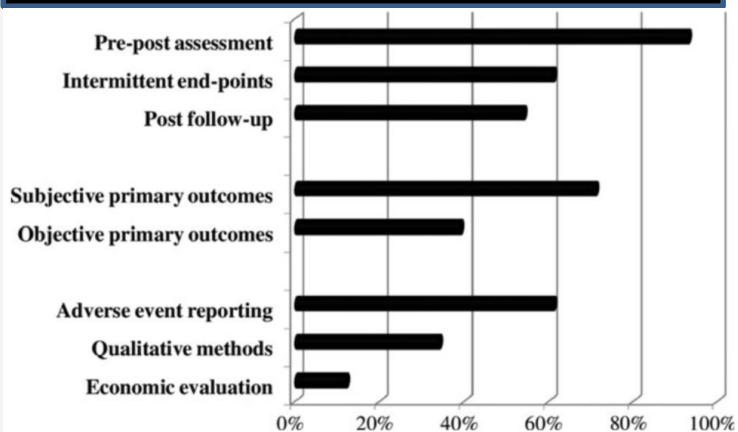
Cheryl Ritenbaugh,^{*} Richard Hammerschlag,[†] Samuel F. Dworkin,[‡] Mikel G. Aickin,[§] Scott D. Mist,[¶] Charles R. Elder,[#] and Richard E. Harris^{**}

Table 2a. Demographic Characteristics of Participants Allocated at Weeks 2 and 10*

TCM differentiations (most salient)				
Liver Qi Constraint	47.5	53.8	34.9	47.6
Qi and Blood Stagnation	37.5	38.5	51.2	38.1
Other [‡]	15.0	7.7	13.9	14.3

Outcome Measures

- **Most common:**
 - Patient-reported outcomes for:
 - Symptom severity
 - QOL / psychosocial
 - Some 'patient-generated' outcomes
 - Some concurrent objective outcome measures



STUDY	OUTCOME ASSESSMENT																		
	Assessment				Subjective				Objective				Other						
	Pre-Post	Intermittent	Follow-Up	Post-Only	Symptom Severity	Psychosocial/Wellness / QoL	Patient-Generated	Treatment Satisfaction	Qualitative Methods	Paradigm-Specific	Functional biomarkers (e.g., bloodwork)	Anthropometrics (e.g., weight, waist:hip ratio)	Health Event (e.g., live birth, cardiac event)	Functional/Disease-Progression tests	Health Service Utilization	Medication Usage	Adherence	Economic Evaluation	Adverse Events
ATTIAS 2016 ⁵⁷																			
AZIZI 2011 ⁷⁷																			
BELL 2011 ^{92,108,109}																			
BEN-ARYE 2018 ⁸⁸																			
BRADLEY 2012 ^{93,110}																			
BREDESEN 2016 ^{97,111}																			
BRINKHAUS 2004 ⁷⁸																			
COOLEY 2009 ⁹⁴																			
DUBROFF 2015 ⁷²																			
ELDER 2006 ¹⁰⁵																			
ELDER 2018 ^{83,112-115}																			
FLOWER 2012 ⁷⁹																			
FORSTER 2016 ¹⁹⁰																			
HAMRE 2007 ^{70,117}																			
HAMRE 2013 ⁷¹																			
HAMRE 2018 ⁶⁹																			
HUANG 2018 ^{80,118}																			
HULLENDER RUBIN 2015 ⁵¹																			
JACKSON 2006 ⁸²																			
JOSHI 2017 ⁷³																			
KESSLER 2015 ⁷⁴																			
KESSLER 2018 ^{75,119}																			
LITCHKE 2018 ¹⁰⁴																			
MCCULLOCH 2011 ^{83,120}																			
MILLS 2016 ⁷⁶																			
ORNISH 1988 ^{80,121}																			
PATERSON 2011 ⁸⁴																			
PERLMAN 2016 ^{34,101,123,124}																			
RIOUX 2014 ²²																			
RITENBAUGH 2008 ⁸⁵																			
RITENBAUGH 2012 ²⁵																			
SEELY 2013 ^{85,127}																			
SHALOM-SHARABI 2017 ⁸⁹																			
SILBERMAN 2010 ^{98,128-130}																			
SUTHERLAND 2009 ²⁹																			
SZCZURKO 2007 ^{96,131}																			
WANG 2016 ¹⁰³																			
WAYNE 2018 ⁹⁰																			
WITT 2015 ⁹¹																			
WELCH 2013 ¹⁰²																			
ZENG 2013 ⁹⁹																			

FIG. 11. Outcome assessment in whole systems research.

Next Frontiers: Paradigm-specific outcome measures

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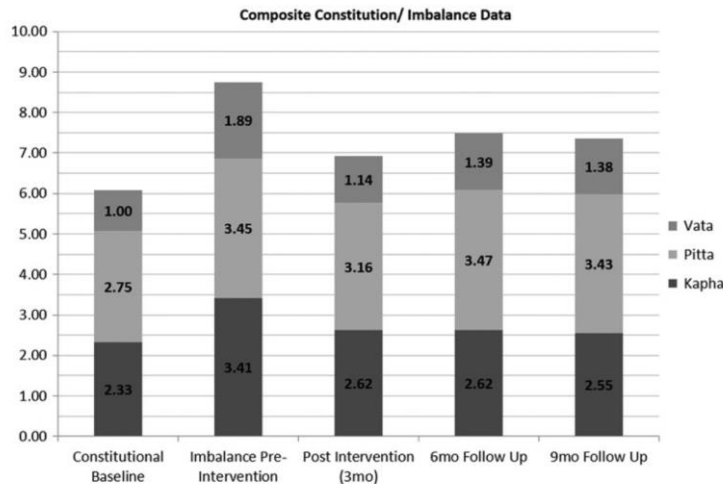
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Outcomes from a Whole-Systems Ayurvedic Medicine and Yoga Therapy Treatment for Obesity Pilot Study

Jennifer Rioux, PhD, AD, AYT, IAYT,* and Amy Howerter, PhD†

Abstract

Objectives: To determine the feasibility and acceptability of an Ayurveda/Yoga intervention for weight loss.



PILOT STUDY

A Prospective Trial of Ayurveda for Coronary Heart Disease: A Pilot Study

Robert DuBroff, MD; Vasant Lad, BAMS, MASc; Cristina Murray-Krezan, BS, MS

Table 1. Dosha Types

Dosha	Prakruti (scale 1-4)	Vikruti (scale 1-4)
	Median (Q1-Q3)	Median (Q1-Q3)
Vata	1.0 (1.0-1.0)	1.0 (1.0-1.0)
Pitta	3.0 (3.0-3.0)	3.0 (3.0-3.0)
Kapha	2.5 (2.0-3.0)	3.0 (3.0-3.5)

Abbreviations: Q1, 25th percentile; Q3, 75th percentile.

Harmonization into Broader Research Schemes

RESEARCH ARTICLE

Open Access

Hierarchies of evidence applied to lifestyle Medicine (HEALM): introduction of a strength-of-evidence approach based on a methodological systematic review

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Abstract

Background: Current methods for assessing strength of evidence prioritize the contributions of controlled trials (RCTs). The objective of this study was to characterize strength of evidence (SOE), identify their application to lifestyle interventions for improved longevity, vitality, or success, and assess implications of the findings.

Methods: The search strategy was created in PubMed and modified as needed for four additional databases, AnthropologyPlus, PsycINFO, and Ageline, supplemented by manual searching. Systematic meta-analyses of intervention trials or observational studies relevant to lifestyle intervention were included.



Prevention Science
<https://doi.org/10.1007/s11121-018-0926-1>



Encompassing Cultural Contexts Within Scientific Research Methodologies in the Development of Health Promotion Interventions

Daniel Dickerson¹, Julie A. Baldwin², Annie Belcourt³, Lorenda Belone⁴, Joel Gittelsohn⁵, Joseph Keawe'aimoku Kaholokula⁶, John Lowe⁷, Christi A. Patten⁸, Nina Wallerstein⁹

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Abstract

American Indians/Alaska Natives/Native Hawaiians (AI/AN/NHs) disproportionately experience higher rates of various health conditions. Developing culturally centered interventions targeting health conditions is a strategy to decrease the burden of health conditions among this population. This study analyzes characteristics from 21 studies currently funded under the Interventions for Health Promotion and Disease Prevention in Native American (NA) Populations program among investigators currently funded under this grant mechanism. Four broad challenges were revealed as critical to address when scientifically establishing culturally centered interventions for Native populations. These challenges were (a) their ability to harness culture-centered knowledge and perspectives from communities; (b) their utilization of Indigenous-based theories and knowledge systems with Western-based intervention paradigms and theories; (c) their use of Western-based methodologies; and (d) their cultural adaptation, if based on an evidence-based treatment. Findings revealed that qualitative methodologies and community-based participatory research (CBPR) approaches were very commonly used to finalize the development of interventions. Various Indigenous-based theories and knowledge systems and Western-based theories were used in the methodologies employed. Cultural adaptations were made that often used formative mixed qualitative and quantitative methods. Illustrative examples of strategies used and suggestions for future research are provided. Findings underscored the importance of CBPR methods to improve the efficacy of interventions for AI/AN/NH communities by integrating Indigenous-based theories and knowledge systems with Western science approaches to improve health.

Keywords American Indians · Alaska Natives · Native Americans · Native Hawaiians · Culture · Interventions

WSR as a Distinctive Field

- Common features with 'pragmatic' research
 - BUT: there are distinctions that unite this work
 - Combination of features (whole as more than parts)
 - Dual diagnosis
- Training new generation of TCIM (clinician)-scientists in model valid methodologies
- Further development of complex analytic models
- **Big questions:** what other 'measurables' are relevant?