Appendix: Research Posters from 6th Annual CCNM Research Day

Design and Evaluation of an Evidence-Based Practice Continuing Education Course for Canadian Naturopathic Doctors 2

What does planetary health mean to health care practitioners? A protocol for a cross-sectional analysis. 3

Adaptations to the Mediterranean Diet that Address Culturally Relevant Food Choices 4

The Teaching Kitchen Landscape in North America: a scoping review 5

Evaluating Magnesium, Zinc and Yoga for Major Depression and Depressive Symptoms: A Narrative Review 6

The Impact of Equine Therapy on Recovery in Stroke Survivors: A Narrative Review 7

Effective integrative health promotion program designs for street-involved youth: A scoping review 8

Varying approaches to urban, food-based community gardens and their relationship to community health and well-being: A scoping review 9

A Scoping Review of the Association Between Vitamin D Status and Multiple Myeloma Risk and Disease Activity 10

Supporting the Well-being of Naturopathic Medical Students: A Pilot Project 11

Treating an HIV+ Patient with Probiotics: A case report of *Blastocystis hominis* pathogenicity. 12

How Do Naturopathic Doctors Define the Quality of Natural Health Products? An Inductive Approach to Establish North American Standards 13

Investigating the Effect of Natural Interventions on Weight Loss in Overweight and Obese Adults: A Narrative Review 14

Evaluating Nonpharmacologic Treatments for Bipolar Depression: A Narrative Review 15

Group Visits in Naturopathic Medicine: Mapping the Alignment 16

Investigating Behavioral and Psychosocial Therapies for the Prevention of Postpartum Depression: A Narrative Review 17

Effects of Outdoor Learning School-Based Education Programs: A Systematic Review on Pediatric Health Outcomes 18

Naturopathic management of acute pediatric respiratory infections: A modified Delphi study. . 19

Maternal Fiber Intake and Perinatal Anxiety and Depression: A Review 20

Tarentula Hispanica in the Treatment of Long-Term Restless Leg Syndrome: A case report 21

Hot and cold theory: A bridge from the past to the future (Narrative Review) 22

A Review of Systems Biology Studies on the Hot-Cold Theory 23

Design and Evaluation of an Evidence-Based Practice Continuing Education Course for Canadian Naturopathic Doctors

Monique Aucoin, ND [1,2,], Genevieve Newton DC PhD [2], Matthew Leach PhD [3], Kieran Cooley ND [1,3-5]

1. Canadian College of Naturopathic Medicine, ON, Canada; 2. University of Guelph, ON, Canada; 3.National Centre for Naturopathic Medicine at Southern Cross University, Australia; 4.University Technology, Sydney, Australia; 5.Pacific College of Health and Science, USA.

Introduction

- Evidence-based practice (EBP) involves the combination of best scientific evidence with clinician expertise and patient preferences in an effort to optimize the quality of patient care.
- A recent survey found that Canadian Naturopathic Doctors (NDs) use evidence frequently in their clinical practice; however, opportunity for improvement exists
- Canadian NDs also reported a high level of interest in opportunities for skill development

Objectives

Primary: Assess the feasibility and acceptability of a co-designed pilot EBP continuing education (CE) course for Canadian NDs.

Secondary: Assess changes in EBP attitudes, skills, use and knowledge following participation.

Methods

Phase 1: Co-design of an EBP CE course

- 3 focus groups conducted using semi-structured interview
- Groups were stratified based on high, moderate and low evidence use at baseline
- Questions asked about EBP definition, EBP education needs, and course preferences
- Data analyzed using thematic analysis
- Focus group results were combined with best practices in EBP education to design the course

Phase 2: Delivery and Evaluation of the EBP CE Course

- Baseline assessment: EBASE questionnaire (EBP attitudes, skill and use), quiz (testing EBP knowledge), demographics
- Course delivery: 1-hour sessions weekly for 5 weeks
- Post-course: EBASE questionnaire; quiz testing (EBP knowledge); participant satisfaction survey
- Analysis: Wilcoxon test comparing baseline and post-course scores; thematic analysis of open text responses

Results

Phase 1:

- 22 Canadian NDs participated in 3 focus groups
- Most participants expressed a high level of interest in an EBP course
- **Theme 1:** Interest in learning about core EBP skills (searching for evidence, appraisal, bias, application)

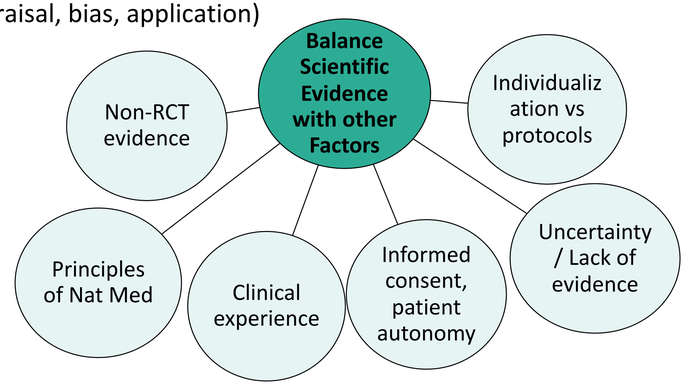


Figure 1. Theme 2 – Balancing scientific evidence with other factors

Phase 2:

Enrollment and Data Collection: 81 participants registered; 61 completed at least 1 assessment and were included in the analysis

Satisfaction: 89%
agreed or strongly agreed that they were satisfied with the course

Attendance: 64%
of participants attended four or five sessions

Table 1. Themes from participant satisfaction survey

Theme	Most Helpful	Least Helpful	Suggestions for Improvement
Difficulty	Basics, advanced topics	Basics, advanced topics	Providing multiple levels of difficulty (basic/advanced)
Format	Interactive components	Pace too fast	Longer sessions; More practical components
Resources			Quizzes and homework

Table 2. Change in EBP Skill, Knowledge, Beliefs and Use

Outcome	Pre-course score	Post-course score	P value
Skills Sub-score	38.92	42.95	P<0.001
Knowledge Quiz Score	10.8	12.1	P<0.001
Belief and Use sub-scores			No significant change

Correlation Analysis:

Weak positive correlation between attendance and change in quiz score

Moderate inverse correlation between baseline quiz score and change in quiz score

Discussions

- There was no significant change in evidence use or EBP attitudes in those completing the course; however, baseline scores were consistent with high use and favorable attitudes
- Some participants found the course too easy, others found it too difficult; indicating the need for multiple levels of difficulty.
- Participants with lower skills at baseline increased their quiz scores most
- There is an interest in including more practical exercises in future versions of the course

Conclusions

- Co-design and delivery of an EBP CE course to Canadian NDs was feasible and acceptable
- Preliminary evidence suggests that participation in the course was associated with improved EBP knowledge and skill
- Participants provided actionable suggestions to improve the course in future iterations

For references or further questions, please
Email: maucoin@ccnm.edu

What does planetary health mean to healthcare providers?

Anna-Liza Badaloo BES, Nathan Uchtmann MD, JD, MS[1,2], Leslie Solomonian ND, MPH[1, 3, 4]

1. Clinicians for Planetary Health; 2. University of California San Francisco, Department of Pediatrics; 3. Naturopathic Doctors for Environmental and Social Trust; 4. Canadian College of Naturopathic Medicine, ON, Canada.

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Background

Planetary health is a significant determinant of individual and population health. Ergo, healthcare providers (HCPs) have an opportunity and arguably a responsibility to promote planetary health as part of their practice. However, this domain has thus far not been integral to the training of many HCPs. Frameworks have been proposed to incorporate principles and practices of planetary health into health professions education, but it is unclear what gaps need to be filled in various professional and global settings..

Objectives

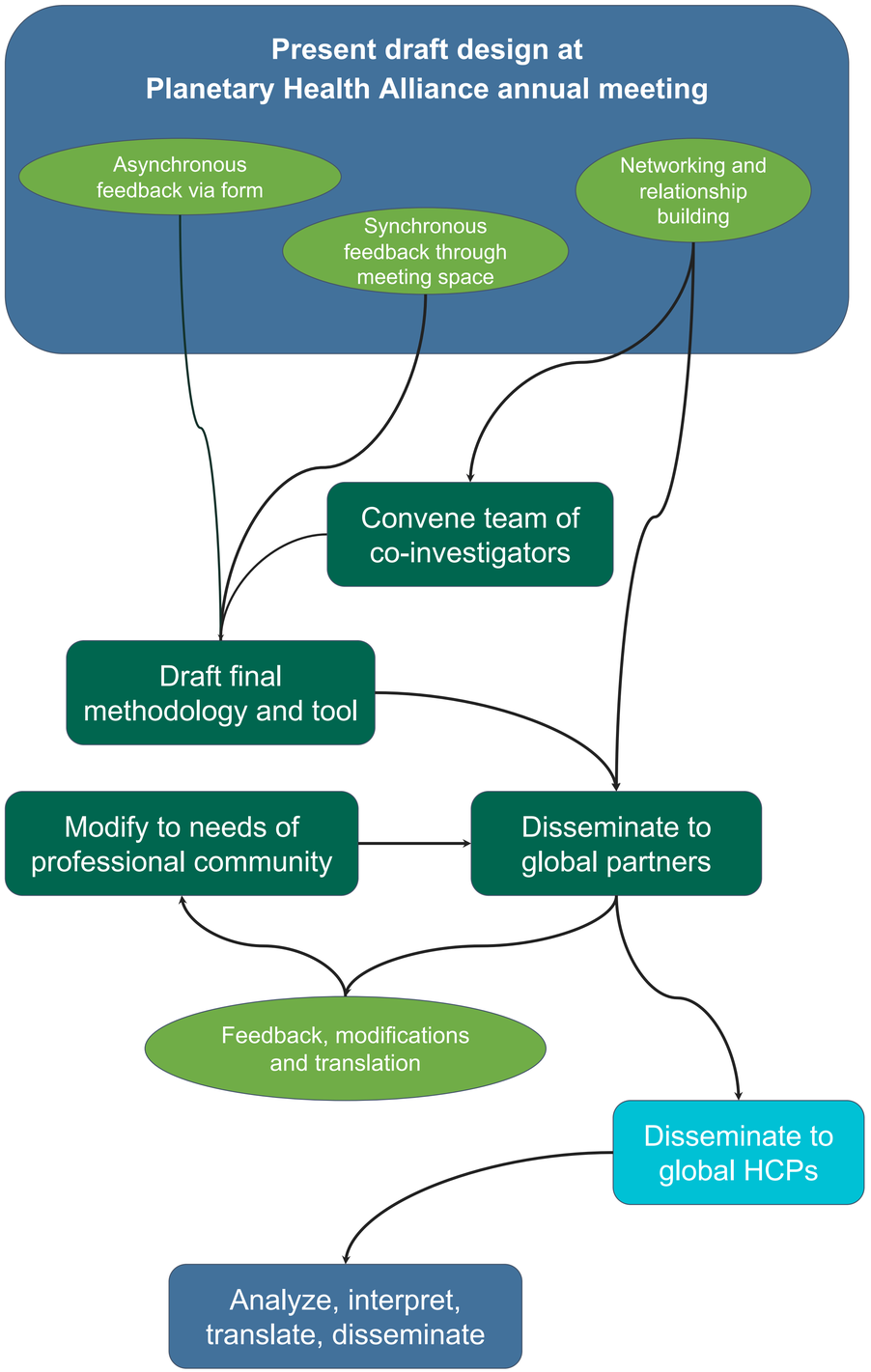
In order to understand how best to support HCPs in building the capacity to promote planetary health in professional practice, we seek to assess existing values, knowledge, and skills of a global cross-section of HCPs. In keeping with the principles of planetary health, we aim to design, disseminate, and interpret this project in a way that is collaborative, relationship oriented, and decentralized.

Methods

We drafted a survey tool informed by the "Canmore Declaration of Principles for Planetary Health," and the "Declaration Calling for Clinicians of the World to Act on Planetary Health," as well as other studies assessing these domains in specific populations of HCPs. We presented our study design at the 2021 annual meeting of the Planetary Health Alliance, and offered mechanism by which conference delegates could provide feedback, and to recruit additional co-investigators.

We now plan to disseminate an invitation to participate to a range of global HCP associations, associations, alliances, coalitions, and regulatory bodies. In order to uphold planetary health principles of mitigating systems of social dominance, and nurturing community engagement, we will invite these organizations to suggest modifications of the tool and methodology to meet the needs of their membership (including translation, scope, and cultural/ geographic relevance).

We will calculate frequency distributions for all variables, and correlate with demographic factors. It is difficult to hypothesize the findings since few studies on this topic have been completed. We won't know in advance the size of the population we are sampling, and are uncertain how high our response rates will be. We anticipate that selection bias will be a notable limitation, but hope the results will inform further work in this field.



Embedding planetary health principles

Sustainable vitality of all systems	Building partnerships and networks, and seeking support from aligned funding agents in order to undertake a long-term process.
Values and purpose	Building on the strengths and resources of the investigator team; seeking to optimize local relevance.
Integration and unity, Biopsychosocial interdependence, and Planetary consciousness	Viewing the planetary health crisis as a unifying opportunity in research. Seeking to understand and adjust for local experiences as a means of strengthening the global web.
Narrative health	Encouraging storytelling through the tool to elucidate lived experience.
Advocacy and Personal commitment to shaping new normative behaviors	Designing the tool to be both educational and extractive; disseminating results to all partners and involving them in the wider dissemination of results. Seeking to embed PH principles in study design and implementation.
Countering elitism, social dominance and marginalization	Aiming to facilitate collaborative, equitable partnerships in all phases of research. Using an iterative process to optimize the overall system.

Conclusions

We hope that this project will both elucidate the current state of affairs with respect to the capacity of HCPs to promote planetary health, and that results will serve to inform future opportunities to center the planet in health care education and practice. Through centering principles of planetary health we hope to build a global community of practitioners who work collectively to improve health for all who share the planet.

Key References

- Prescott SL, Logan AC, Albrecht G, Campbell DE, Crane J, Cunsolo A, Holloway JW, Kozyrskyj AL, Lowry CA, Penders J, Redvers N, Renz H, Stokholm J, Svanes C, Wegienka G, OBoiPHotWUN. The Canmore Declaration: Statement of Principles for Planetary Health. *Challenges*. 2018; 9(2):31. https://doi.org/10.3390/challe9020031
- Planetary Health Alliance, Clinicians for Planetary Health Working Group, WONCA Working Party on the Environment. Declaration calling for clinicians of the world to act on planetary health. https://files.visura.co/users/12837/9c0af30afdb8667feb2542f973bb47e6.pdf

For references or further questions, please email: lsolomonian@ccnm.edu

Mediterranean Diet Adaptations to Traditional Cultural Eating Paradigms

Nana-Adjoa Bourne, ND, CISSN [1,2], Kieran Cooley, ND [1], Gursharan Mangat, BSc, CCNM graduate

1.Canadian College of Naturopathic Medicine, ON, Canada; 2. Insight Naturopathic Clinic, Toronto, ON, Canada

CCNM CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- The Mediterranean Diet (MD) is well for its benefits in metabolic risk factors since research began in 1958.
- Metabolic risks include cardiovascular disease, diabetes, obesity, etc.
- Barriers still exist to diet adherence from various cultural groups including African, Asian, Latin American and Indigenous.
- Research exists supporting traditional diets and health benefits
- The MD promotes specific foods and health benefits can be broken down into a framework of specific constituents and macronutrient proportions.
- Below represents a reference of traditional food sources adapted to the MD framework in order to maintain metabolic health benefits.

Objectives

To provide a resource for health care providers to give more culturally competent dietary suggestions to patients of all backgrounds. This will aid in extracting the benefits of the MD with foods from various cultural backgrounds.

Search Methods

- Pubmed, Cochrane and PMC search engines were used to identify evidence on constituents of the MD and their health benefits (e.g. fiber and cholesterol).
- Search terms included in but not limited to examples in Table 1.
- Cultural regions and foods were categorized based on *Oldways (https://oldwayspt.org)*.
- MD constituents were placed into categories by health benefits and then mapped to cultural food groups based on research findings (Table 2).

Table 1: Research Methods

Diet Population	Search Terms (not limited)	Exclusions
• African (Ghana, Kenya, Cameroon) • Indigenous (Pima Indian) • South Asian (India, Nepal, Pakistan) • Latin American (Mexico) • Mediterranean • East Asian (China, Japan, S. Korea, Taiwan)	• "Flavonoids" AND "Cardiovascular" • "African diet" AND "HbA1c" OR "glucose" • "East Asian" AND "diet" • "Traditional Native American Diet" • "Latin American Diet"	• Supplement interventions (ie natural health products not from dietary sources). • End stage disease (e.g., CHF)

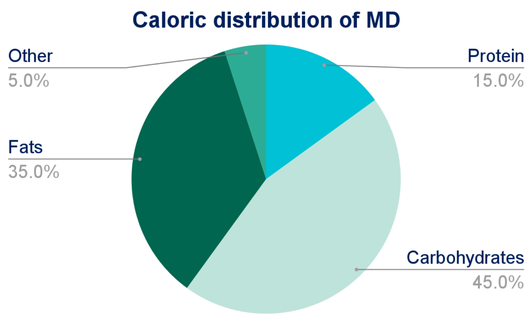
Results

Table 2. Components of MD applied to 6 broad cultural eating paradigms

Culture/Region	Whole grain (Fiber)	MUFAs & PUFAs	Lean protein	Fresh produce (Flavonoids)	Drinks
East Asian	• Rice • Wheat • Corn • Barley • Oats	• Seafood • Sesame • Sunflower • Walnuts • Almonds	• Chicken • Duck • Fish • Soy products	• Spinach • Bok Choy • Cabbage • Seaweed • Legumes	• Green Tea • Jasmine Tea • Awamori • Coffee
South Asian	• Rice • Semolina • Gram flour • Buckwheat • Lentil flour	• Ghee • Flaxseed • Pumpkin seed • Walnut	• Lentils • Eggs • Fish • Chicken • Paneer	• Spinach • Jackfruit • Guava	• Coconut water • Buttermilk • Jal Jeera • Rasam
Latin American	• Maize • Amaranth • Wheat • Squash • Yuca	• Avocado • Chia seeds • Pumpkin seeds • Peanuts	• Beans • Chicken • Turkey • Duck • Venison	• Tomato • Citrus Fruit • Onion • Jicama • Spirulina	• Coffee • Teas
African	• Maize • Millet • Sorghum • Cassava • Yam	• Peanuts • Palm nut	• Lentils • Beans • Pulses • Fish	• Cocoyam • Jute leaves • Kale • Cabbage • Plantain	• Guava • Watermelon juice • Soursop tea
Indigenous	• Corn • Wheat • Amaranth • Mesquite • Wild rice	• Salmon • Sunflower Seeds • Eggs	• Elk • Trout • Lima beans • Deer • Bison	• Carrots • Melons • Cactus Fruit • Spinach • Squash	• Water • Herbal teas
Mediterranean	• Wheat • Cereal grain • Buckwheat • Farro • Millet	• Olive oil • Avocado • Walnut • Sesame • Almonds	• Salmon • Tilapia • Clams • Beans • Chicken	• Spinach • Beets • Broccoli • Figs • Clementine	• Red wine

Figure 2. Caloric distribution based on MD[8]

Example of a plate breakdown that can be used to educate patients on how to apply the MD to their cultural food groups based on calories and macronutrients.



Discussion

- Components of the MD are broken down into 4 major constituents: Fibre, Fatty Acids, Lean Protein, Flavonoids.
- Additional categories, such as drinks, increase adherence.
- 5 major cultural regions are identified in research with traditional diets and foods that promote similar effects to the MD
- Cooking methods, food storage/preservation may vary for same food in different regions/cultures
- Sociological factors influence adherence to traditional diet (religion; socioeconomic status/ access to; involvement in community; physical activity

Limitations of research:

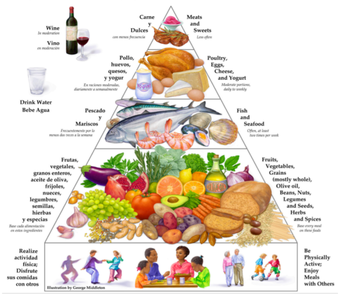
- Research done on specific tribes/regions/ethnic group may not be applicable across the country.
- Although some evidence exists for the effectiveness of traditional diets, there is a paucity of specific evidence relative to other culturally competent diets eaten in N. America and their metabolic health benefits.

Clinical Application

Caloric distribution based on MD can be applied to various cultural eating paradigms using an approximate caloric breakdown.

Figure 3. Pyramid of Mediterranean diet[9]

Example of a pyramid model that can be used to educate patients on how to apply the MD to their cultural food groups.



Acknowledgements: Thank you to Prabhjot Chohan, Yumna Farooq, Vaidehi Patel and Herpreet Singh for assistance with literature researches and mapping of cultural diets.

Conclusions

Adhering to a culturally traditional diet while maintaining caloric distribution based off of the MD, the authors hypothesize metabolic benefits can be derived. This also promotes decreasing barriers to health access. Future research should explore patient adherence, provider education, and impact of cultural adaptations to the MD for metabolic disorders.

For references or further questions, please email: nbourne@ccnm.edu

The Teaching Kitchen Landscape in Canada & the United States: A scoping review

Gina Brown, CCNM Student [1], Tiffany Turner, ND [1], Neda Ebrahimi, PhD[1], Kieran Cooley, ND[1-4]

1. Canadian College of Naturopathic Medicine, ON, Canada; 2. University of Technology Sydney, Ultimo, Australia; 3. Pacific College of Health Sciences, San Diego, USA; 4. National Centre for Naturopathic Medicine, Southern Cross University, Lismore, Australia

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

Public health researchers have concretely established the role of diet and nutrition and their role in disease prevention and management across all population levels. While many programs aim to enhance the nutrition literacy of its participants, there is a role for food skill instruction in equipping individuals with the skills needed to translate nutritional knowledge at a practical level. Teaching kitchens provide "hands-on culinary instruction with concurrent education of nutritional concepts, exercise, mindfulness, and behavioural change". This study will be the first scoping review on the topic, providing a foundation to inform future implementation practices of such education practices to improve health outcomes, food literacy and food agency in program participants.

Objectives

- The extent of teaching kitchen utilization in Canada and the USA
- Common methods used to implement such programs
- What benefits they provide at the individual and population level
- To build a foundation of evidence to inform future research

Methods

Table 1: Arksey and O'Malley Framework Stages

Identify the research question	• What does the existing body of literature reveal on the use of teaching kitchens to improve cooking skills, food literacy, and health outcomes?
Identify relevant studies	• A preliminary search of key databases (PubMed and CINAHL) was undertaken to identify articles on the topic. • All identified key words and index terms was then adapted for each information source and included searches on PubMed, MEDLINE, CINAHL, and Cochrane Library. • Sources of unpublished studies and grey literature searched across multiple platforms including targeted search engines, clinical trial databases, government documents, and institutional repositories. • Studies published only in the English language, from 2011 onwards, and only those conducted in the United States and Canada were included.
Study selection	• All identified citations were collected and exported to online screening tool and duplicates were removed. • Titles and abstracts screened by two independent reviewers for assessment against the inclusion criteria for full text review. • Full text review was completed by two independent reviewers
Chart the data	• Data is currently being extracted using an extraction tool developed by the reviewers, including standard information (e.g., author, year of publication) and specific details about the participants, concept, context, study methods and key findings relevant to the review question.
Collect, summarize, and report the results	• The extracted data from the sources selected for inclusion in the scoping review will be charted and presented in a narrative summary and descriptive analysis will be conducted to report on the variety of implementation strategies, methods, objectives and the context of delivered programs.

Screening Protocol

PRISMA Flow Diagram

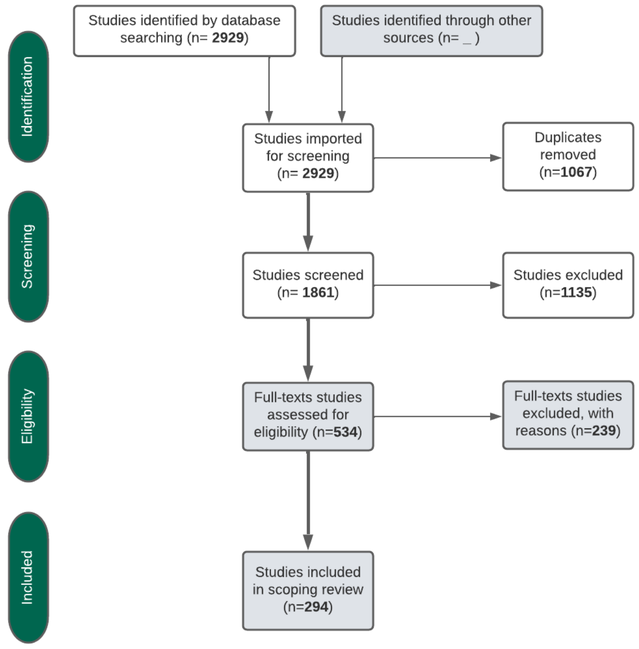


Figure 1. PRISMA Flow Diagram of our scoping review study selection protocol. White boxes represent steps completed, while grey boxes represent future steps. This diagram is subject to change over the course of the project.

Emerging Themes

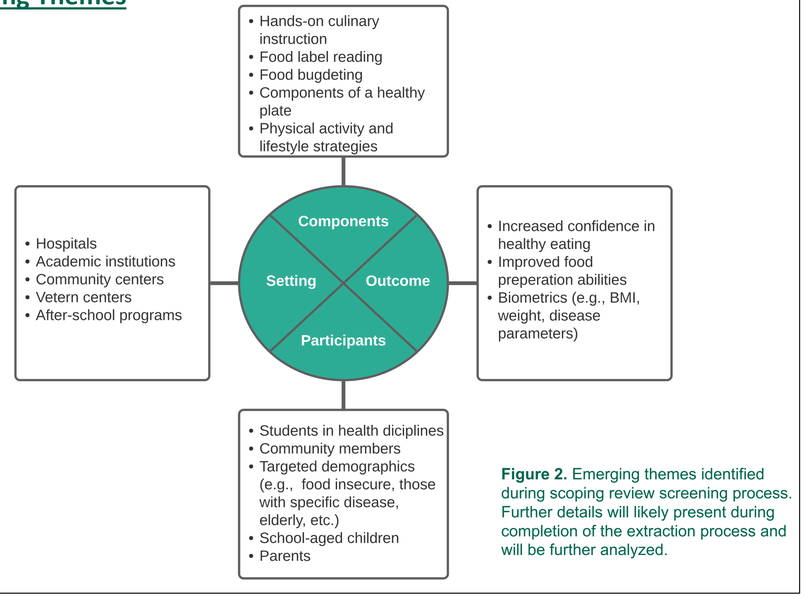


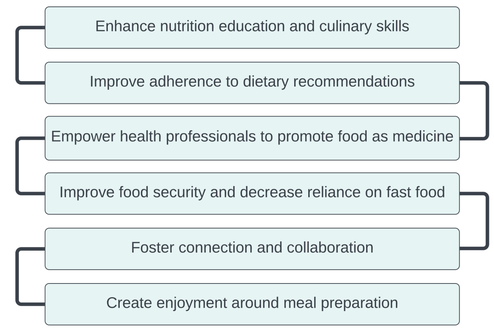
Figure 2. Emerging themes identified during scoping review screening process. Further details will likely present during completion of the extraction process and will be further analyzed.

Discussion

What is a Teaching Kitchen?

- As defined by the Teaching Kitchen Collaborative, a teaching kitchen is "a virtual learning laboratory of life skills that offer basic cooking techniques in addition to other self-care topics such as enhanced nutrition, mindfulness, physical activity, and behavioral health coaching".
- Teaching kitchens can be implemented in a variety of settings and aim to improve the way that people eat. While a new concept, research on teaching kitchens currently aims to explore their role in various health conditions, social determinants of health, and food literacy.

Why Teaching Kitchens?



Current Stage & Results

- Academic literature search has been completed with results (n=2929) imported into an online screening tool.
- With the elimination of duplicates, titles and abstracts (n=1861) were screened against pre-established inclusion and exclusion criteria by two research team members.
- Studies identified for inclusion, or that required more information to determine eligibility (n=534) were then assessed in full text by two research team members.
- Studies that passed the two-stage screening process are eligible for inclusion in the scoping review and are now in the process of extraction to a pre-developed data extraction template.
- Following completion of data extraction, information will be reviewed to compile available information of teaching kitchen programs.

Study Protocol

The full scoping review protocol, including the data extraction template can be accessed here:
https://osf.io/gd8fu/?view_only=88d8bb4bb5174a6dacce48e2ad44d6f2

Future Implications

The results obtained through this scoping review may assist in guiding future initiatives to actively map teaching kitchen resources in Canada and may provide a useful tool for collaboration and advancement within this field.

For references or further questions, please email: gbrown@ndnet.ccnm.edu

Evaluating Magnesium, Zinc and Yoga for Major Depression and Depressive Symptoms: A Narrative Review

Adam Gratton, ND [1], Camilia Destteffano, CCNM student [2]

1. Canadian College of Naturopathic Medicine, ON, Canada; 2. Institute of Medical Science, University of Toronto, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Depression affects more than 350 million people worldwide with increasing prevalence. It has a major impact on quality of life and mortality.
- Current first line conventional treatments provide remission in approximately one-third of patients.
- Alternative interventions have demonstrated clinical efficacy in ameliorating the signs and symptoms of depression, however consistent evidence to support their use is limited and in need of further exploration.
- Further research will enable more accurate risk/benefit estimations to be made for alternative and conventional treatments alike

Objectives

To evaluate and summarize the available research on the use of yoga, zinc and magnesium for major depression and depressive symptoms.

Search Methods

Search databases included: PubMed and Google Scholar.

- All searches were limited to systematic reviews with meta-analyses and randomized controlled trials (RCT's) published on humans in English.
- 248 **yoga** studies were found, 3 of which met the inclusion criteria.
- 65 **magnesium** studies found, 3 of which met the inclusion criteria.
- 59 **zinc** studies were found, of these 1 meta-analysis and two additional RCT's met the inclusion criteria.

PICO Framework

P	Adults/adolescents with mild to major depression		
I	Magnesium	Zinc	Yoga
C	Placebo	Placebo	No intervention
O	Change in PHQ-9, BDI, HAMD or HDRS score		

Results

Table 1: Magnesium

Authors	Intervention	Control	Results
Tarleton et al., 2017	126 adults diagnosed with depression given 248 mg of elemental magnesium ($MgCl_2$) per day for 6 weeks.	Initial Scores.	Clinically significant improvement in PHQ-9 scores of -6.0 points (CI -7.9, -4.2; P<0.001) and net improvement in Generalized Anxiety Disorders -7 scores of -4.5 points (CI -6.6, -2.4; P<0.001)
Ryszewska-Pokraśniewicz et al., 2018	37 participants with recurrent depressive disorder given fluoxetine (20-40 mg per day) + magnesium ions (120 mg/day magnesium aspartate) for 8 weeks	Initial Scores and Placebo group.	50% improvement in HDRS scores in 15 participants (88%) from group I and in 11 participants (73%) from group II. No significant difference between groups in treatment efficacy: The fluoxetine-and-magnesium group showed higher rates of 50% improvement on HDRS scoring but the difference was not statistically significant.
Afsharfar et al., 2021	46 depressed subjects received magnesium oxide (500 mg) for 8 weeks.	Initial Scores and Placebo group.	Supplementation with magnesium oxide had a significant effect on Beck's test (-3.53), (P = 0.01) and serum magnesium (P = 0.001), but had no significant effect on BDNF levels (P = 0.507) between the two groups.

Table 2: Zinc

Authors	Intervention	Control	Results
Schefft et al., 2017	Systematic review and meta-analysis of 3 available RCT's on zinc as an adjunct to antidepressants. 25 mg oral zinc given for 6-12 weeks.	Standard Care.	Adjunctive zinc in antidepressant treatment was found to be statistically significant (SMD= -0.66 [-1.06; -0.26],z= -3.22, p<0.01). No heterogeneity was detected between studies (Q(df=3)=2.64, p=0.45, I2=0%).
Yosaee et al., 2020	140 obese/overweight participants randomized to 30 mg/d zinc gluconate + vitamin D placebo or 2K IU/d vitamin D + 30 mg/d zinc gluconate for 12 weeks.	Initial Scores and Placebo group.	Significant decrease in BDI-II in zinc (-7.02), vitamin D, or joint zinc-vitamin D supplement groups compared with placebo (P < 0.001). Zinc significantly more effective than vitamin D on decreasing depression scores. No significant effects on serum cortisol (P = 0.974) or BDNF (P = 0.076).
Solati et al., 2015	Fifty overweight or obese subjects randomly assigned to 30 mg zinc daily for 12 weeks.	Initial Scores and Placebo group.	Serum zinc and BDNF levels increased significantly in intervention group not placebo group. BDI scores declined significantly in both groups: but reduction in the zinc-supplemented group (-4) was significantly higher than in the placebo group (-1).

Table 3: Yoga

Authors	Intervention	Control	Results
Falsafi et al., 2016	90 students over age 18 who had a diagnosis of anxiety and/or depression assigned 8-week yoga training.	Non-intervention group.	Depressive symptoms decreased significantly. Significant reduction in BDI scores (-10.9) at the end of the intervention compared to baseline in the yoga intervention group but not in the control group.
Prathikanti et al., 2017	20 participants assigned 90-minute hatha yoga practice groups twice weekly for 8 weeks.	Non-yoga Attention control group.	Yoga group more likely to achieve remission, defined per final BDI score ≤ 9 (p-value = 0.018). Effect size of yoga in reducing BDI scores was large, per Cohen's d = -0.96 [95%CI, -1.81 to -0.12].
Tolahunase et al., 2018	58 MDD patients randomized to yoga group for 12 weeks.	Non-intervention group.	Yoga significantly increased DHEAS, sirtuin 1, and telomerase activity levels; decreased cortisol, and IL-6 levels, in addition to decreasing DNA damage and balancing oxidative stress. Significant decrease in BDI-II score [-5.83 (-7.27, -4.39), p < 0.001] and significant increase in BDNF (ng/ml) [5.48 (3.50, 7.46), p < 0.001] after yoga- and meditation- based lifestyle intervention (YMLI) compared to the control group.

Discussions

- Magnesium, zinc and yoga all demonstrated benefit in the treatment of mild to major depression. The greatest benefit was seen with yoga, which is congruent with conventional recommendations for exercise to treat mild depression.

Strengths

- All interventions examined appear to have neuromodulating potential, suggesting benefit in the realm of psychological disorders which display neurological imbalance and dysregulation.

Limitations

- Study sizes are small.
- Neither participants nor intervention providers could be blinded to allocation in yoga studies, thereby increasing risk of performance bias.

Mechanisms of Action

- Magnesium has an anti-inflammatory effect, potentially due to its role in NMDA and glutamate activity.
- All interventions showed some ability to increase BDNF.
- Yoga therapy was able to significantly reduce neuroinflammatory marker IL-6 and increase neuroplasticity.
- Reductions in serum cortisol were seen with both zinc and yoga interventions.

Conclusions

- Yoga, magnesium, and zinc are all promising alternative therapies in the treatment of depression in adults and adolescents.
- Supplementation of zinc and magnesium with or without conventional medication appears to be safe and effective.
- Yoga as a depression intervention based on the studies examined, was shown to have the greatest magnitude of benefit.
- Given the limited research available on these interventions, more research is warranted to verify these findings. Larger population sizes studied for longer periods of time are especially needed.

For references or further questions, please email: cdestteffano@ndnet.ccnm.edu

The Impact of Equine Therapy on Recovery in Stroke Survivors: A Narrative Review

Maha Ghannoum CCNM Student [1] , Adam Gratton MSc ND [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

Stroke survivors face many psychosocial and physical challenges. With 80% of stroke survivors discharged into the community, there is a need to facilitate the return to routine activities. Previous studies report that hobbies are associated with productivity and happiness, suggesting the potential for them to be used to facilitate recovery. Existing literature has pointed out the therapeutic benefit of horseback riding, which is purported to help with improving muscle strength. The purpose of this investigation was to analyze the potential therapeutic impact equine therapy has on the recovery of stroke survivors.

Objectives

The paper is considering "What impact does therapeutic horseback riding have on the recovery of stroke survivors?"

Search Methods

PsycInfo, PubMed, Frontiers, SciELO, Taylor & Francis Online, Annals of Rehabilitation Medicine, J-STAGE, and PLOS ONE were searched using the following search terms: "Therapeutic Horseback Riding," "Hippotherapy," "Horseback Riding Therapy," "Equine Therapy," "Stroke patients," Stroke recovery," "Brain damage," "Traumatic Brain Injury," "intervention," "Strategy," "Rehabilitation." Studies that specifically included stroke survivors within the study population, examined therapeutic horseback riding interventions that involved either mechanically simulated or traditional horseback riding studies, and were published in English were included.

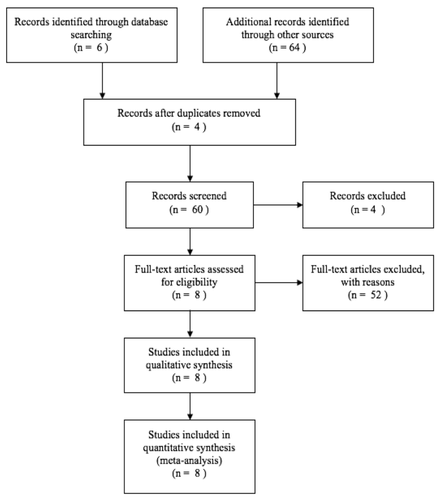


Figure 1. Flow chart of the screening and selection process in the narrative review.

Results

- Half of the studies explored the effects using an actual horse and the other half used a mechanical horse simulation.
- Most studies were conducted in Korea (50 %) and Brazil (25%), followed by England (12.5%), and France (12.5%). The review primarily consists of controlled trials (87.5%) only one of which was not randomized (Han et al., 2012) which was a non-randomized prospective positive-controlled trial. Other study designs included pilot studies (12.5%)
- Studies commonly lasted 12 weeks (37.5%) with a range of 4 (12.5%) to 16 weeks (25%).
- Session durations were commonly 30 min. While most studies took place two-three times per week (75%), two studies took place five times a week (25%)
- Participants showed significant improvement in balance and a positive effect on the participants mental health, summarized in table 1 below.

Table 1

Interventions implemented for stroke survivors and their effectiveness

Study, year	Intervention	Duration (weeks)	Efficacy measurement	Type of horse
Baillet et al., 2019	Horse group: 30 min on Mechanical Horse Simulation twice a week. Control: conventional physical therapy (no horse intervention)	12	After 24 sessions, the horse group had better coordination, and were able to adabpt and develop specific modes of postural coordination.	Mechanical Horse Simulation
Beinotti et al., 2010	Horse group: Therapeutic Horseback Riding once a week and conventional treatment twice a week Control group: conventional treatment 3 times a week.	16	Significant improvements were observed in the experimental group significant improvement in balance.	Actual Horse
Beinotti et al., 2013	Horse group: Therapeutic Horseback Riding and conventional treatment Control group: conventional treatment.	16	The combination of conventional physiotherapy and HBRT was associated with improvements in functional capacity and mental health	Actual Horse
Han et al., 2012	Horse group: 30 min on Mechanical Horse Simulation twice a week Control: conventional physical therapy (no horse intervention)	12	Improved balance, significant improvement on gait parameters.	Mechanical Horse Simulation
Lee et al., 2014	Horse group: Therapeutic Horseback Riding 30 min, 3 days per week Control Group: treadmill 30 min, 3 days per week	8	Balance, gait velocity, and step length asymetry ratio significantly improved.	Actual Horse
Lee and Kim, 2015	Both groups received neurodevelopment treatment for 30 minutes every day, 5 times a week. Horse group: Mechanical horseback riding 30 min, everyday, 5 times a week.	6	Balance significantly improved in the horse group, they were significantly quicker in the horse group, and depression was rates were much lower in horse group.	Mechanical Horse Simulation
Pohl et al., 2018	Horse group: Therapeutic Horseback Riding (Two 240-minute sessions), Rhythm and music group, control group	12	"Participants reported having learned new skills, increased self-efficacy and self-esteem, and improvements in balance and gait, all of which could be transferred to everyday life."	Actual Horse
Sung et al. 2013	Randomized control trial. Control (n = 10) that received conventional rehabilitation for 60 min/day, 5 times/week for 4 weeks and experimental group (n = 10) that used a hippotherapy simulator for 15 min/day, 5 times/week for 4 weeks after conventional rehabilitation for 45 min/day.	4	"Hippotherapy simulator to patients with stroke can improve asymmetric weight bearing by influencing trunk muscles."	Mechanical Horse Simulation

Discussions

- The studies were investigated in great detail exploring study design and results
- With the present studies there is evidence for positive outcomes of therapeutic horseback riding improving coordination, gait velocity, balance, and mental health.
- However limitations in the studies were present as seen in the below pie chart, more studies need to be done with more participants.
- Future studies could consider using both Mechanical stimulations and a real Horse to minimize the associated risks, as a case study highlighted (Chang et al. 2018)

Conclusions

As the evidence suggests, Therapeutic Horseback Riding aids the recovery of the stroke survivor; future research needs to investigate the most efficient Therapeutic Horseback Riding method, analyzing the interventions' specifics, including the session and intervention duration.

For references or further questions, please email: (mghannoum@ndnet.ccnm.edu)

Effective Integrative Health Promotion Program Designs for SIY: A Scoping Review

Samantha Helm, CCNM Student [1], Meagan McLaren, CCNM Student [1], Leslie Solomonian, ND [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- An estimated 150,000 youth in Canada are considered street-involved.
- Street-involved youth (SIY) encounter high levels of stigma, discrimination, sexual and physical violence, and financial instability.
- SIY have decreased access to healthcare, social services, employment, education, nutrition, and housing.
- A multifaceted approach to health and wellbeing may address the challenges that street-involved youth experience, improving emotional, physical, spiritual, structural, and social determinants of health.

Objectives

Evergreen Center for SIY seeks to expand their healthcare clinic from a medically plural provision of individual services (including naturopathic care), to a more integrated and holistic health promotion strategy. This scoping review maps the attributes and impacts of existing programs to guide the design and focus of this initiative.

Search Methods

- Followed established methods for a scoping review 38 studies were identified and reviewed
- Extensive PubMed database search

Table 1: Search Framework

Population
• Human Participants • Street-Involved Youth
Intervention
• Included articles describing existing integrative health programs for SIY • Human Intervention • Exclude: Preclinical studies (animal, in vitro), non-English publications, opinion articles
Search Terms
• "integrative," "health promotion", "street-involved youth", "community", "homeless youth", "vulnerable youth", "socially vulnerable youth" "programs" and "determinants of health".

Results

- Different aspects of integrative health promotion program designs were taken from studies that met the search criteria and were compiled to show successful and unsuccessful approaches.
- The research exploring integrative health program for SIY is limited.
- Available research demonstrated the following themes were successful at building relationships with youth positively that impacted their well being;

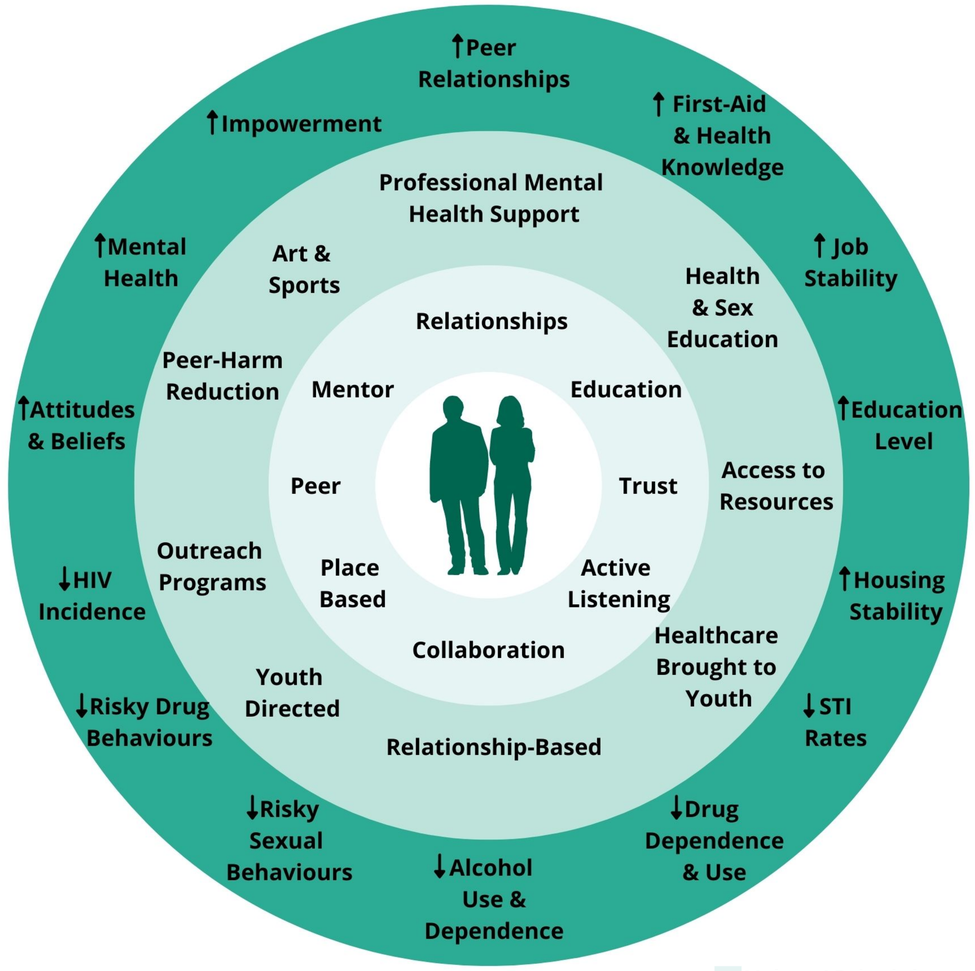


Figure 1. Effective Therapy Strategies

Discussions

Significance of Research

1. Building evidence-based programs increases success and compliance
2. Programs should be based on and adapt youth perceptions/opinions
3. Organizations can use identified strategies to develop successful programs moving forward
4. Future programs should evaluate long-term effectiveness and shortcomings

Gaps in the Literature

- Limited studies on integrative health programs for SIY.
- Multifaceted health approaches were often complex. Highlighting the need for a more efficient method of delivery.
- Limited research followed the intervention strategies long-term.

Conclusions

- Organizations serving this population (i.e., Evergreen) are encouraged to apply evidence-informed lenses to program design and evaluation to support this at-risk group.
- These organizations can utilize the themes identified in this review to develop and implement successful intervention programs

For references or further questions, please email: (shelm@ndnet.ccnm.edu)

Varying approaches to urban food-based community gardens and their associations with community well-being: A scoping review

Rylee MacGregor, CCNM Student [1] Ben Wilke, CCNM Student [1] Charlotte Litjens, MS, CCNM Student [1] Leslie Solomonian ND, MPH [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Community gardening offers physical and mental benefits to individuals and strengthens community well-being.
- Research has shown that community gardening improves nutritional literacy and fruit and vegetable intake, increases physical activity, promotes food security and sovereignty, and improves stress levels.
- The COVID 19 pandemic emphasized the importance of community resilience. Community gardening may improve resilience along with individual wellbeing.

Hypothesis

We hypothesized that varying design and intentions underpinning gardens may have different effects on the community and personal health and resilience. Specifically, group community garden plots may have different outcomes associated with them than individual plots. This scoping review aimed to map the available evidence for different models of gardening to inform approaches to the design of community gardens.

Search Methods

- We searched the following databases:
  - MEDline Complete
  - PubMed
  - APA PsychArticles
  - Alt Healthwatch
  - Web of Science
  - Google Scholar
- The following search terms were used:
  - community gardens/collective gardens AND mental health AND well-being AND public health AND social.

Table 1: PICO framework

Population	Intervention	Outcomes
• Urban community gardeners	• Community gardens with individual plots • Community gardens with group plots	• Measures of individual well-being • Measures of community well-being and resilience

Inclusionary criteria: Studies evaluating gardening via controlled interventions or observation by qualitative or quantitative methods that measured social and psychological indicators of individual well-being, along with markers of community resilience were included.

Exclusionary criteria: Research on non-edible, school, and non-urban gardens.

Figure 1: Well-being outcomes

Results

- 32 studies met our search criteria; 14 were qualitative, 13 quantitative, and five use mixed methods.
- Data was collected in North America, Europe, Australia, Asia, and the Middle East.
- Three studies showed the benefits of community gardening during the COVID 19 pandemic specifically.
- Two studies assessed differences in outcomes by gardening type, with respect to personal well-being and mental health, and found that community gardening may be superior to individual/home gardening, and group style gardens may be superior to personal/allotment style gardens.

Discussion

This study used a broad definition of individual and community well-being. This yielded a high number of results, which was both a strength and a limitation for this scoping review.

Two studies compared well-being outcomes according to individual vs group plot type of community gardening. However, these studies

- Were conducted prior to the COVID-19 pandemic.
- Used data from questionnaires only.
- Were conducted in Tokyo and Singapore.

Future research should:

- Use a more expansive set of research methods.
- Use a more specific definitions of well-being.
- Compare results in other parts of the world.

Conclusions

There is a need for additional research comparing well-being and resilience outcomes between individual vs group plot type of community gardening. Based on this review, we hope to develop a community-based research project with a local urban farm to understand the impacts further.

For references or further questions, please email: (Litjens@ndnet.ccnm.edu

A Scoping Review of the Association Between Vitamin D Status with Multiple Myeloma Risk and Disease Activity: Interim Update

Naghmeh Mirhosseini, PhD, MD (Iran), CCNM Student [1,2,3], Athanasios Psihogios, ND(Inactive), MPH [1,2,4], Dugald Seely, ND, MSc, FABNO [1,2,4]
1. Canadian College of Naturopathic Medicine, ON, Canada; 2. The Centre for Health Innovation/Patterson Institute for Integrative Oncology Research, ON, Canada;
3. School of Public Health, University of Saskatchewan, SK, Canada; 4. Ottawa Hospital Research Institute (OHRI) , Clinical Epidemiology Program, ON, Canada

THE CENTRE FOR HEALTH INNOVATION
Your key to good health

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Multiple myeloma (MM) is a malignancy of atypical plasma cells that proliferate enormously in bone marrow microenvironment and produce monoclonal antibodies[1].
- According to the Canadian Cancer Statistics 2021, MM accounts for 1.9% of total projected new Canadian cancer cases in males and 1.4% in females[2].
- Patients with MM are often burdened by lytic bone lesions, pain, fractures, renal dysfunction, hypercalcemia, anemia, and infection[1].
- Vitamin D has been deficient in 32.5%, insufficient in 54.2% and normal in only 13.3% on MM patients[3].
- Pre-clinical data suggests that vitamin D may play a role in the etiology of MM, disease activity, and possibly in disease progression[4].
- Vitamin D deficiency is a predictor for poor overall survival in patients with multiple myeloma, even after adjusting for age and stage[5].

Objectives

- To conduct a scoping review to map the literature and explore the relationship between vitamin D and MM, focusing on serum levels of vitamin D and the relationship between deficiency with disease risk, progression, and/or survival.
- To determine the prevalence and incidence of deficiency in this population and possible clinical application

Methods

- Three bibliographic databases (OVID-Medline, OVID-Embase, and OVID-Cochrane Library) were searched on August 18th, 2021, without date restrictions, using a structured approach.
- Studies **were included** if vitamin D was the primary intervention or exposure and involved patients with MM and/or MGUS and/or SMM, and was primary research, and published in English, French, or Persian, and included endpoints related to clinical outcomes, risk, prevalence, incidence, and/or disease progression/survival.
- Studies **were excluded** if they were non-primary research, were non-peer reviewed, or focused on synthetic forms of vitamin D (analogues).
- Retrieved records were initially deduped using Zotero (referencing software), and then uploaded to Rayyan, a free online tool for conducting reviews.
- Two independent investigators screened all records by title and abstract (blinded), using a pre-specified list of eligibility criteria. Full texts of remaining records were screened using the same approach, followed by data extraction and verification.

Results

- The search strategy yielded 322 records from OVID-Medline (0 duplicates identified), 1100 from OVID-Embase (17 duplicates identified and subsequently removed), and 68 from OVID-Cochrane Library (2 duplicates identified and subsequently removed), producing 1471 studies after inter-database deduping.
- After records from all three databases were amalgamated, and intra-database deduping was performed by Zotero (207 studies removed), 1264 remained, which were uploaded to Rayyan for screening.
- Abstract and title screening were performed independently by two investigators (NM and AP) which excluded 1214 records. A remaining 50 records were screened after full text review which excluded 34, leaving 16 studies for data extraction.
- Data extraction of the 16 included studies is currently underway.

Discussions & Conclusion

- A structured literature search, using three bibliographic databases, was feasible and produced a sufficient study yield to perform a scoping review.
- We identified 16 studies that met our scoping review criteria, that will undergo data extraction in order to identify themes and trends, and possibly generate new hypotheses on the topic.

References

[1]Kumar R, Himani, Gupta N, Singh V, Kumar V, Haq A, Atif Mirza A, Sharma A. Unveiling molecular associations of polymorphic variants of VDR gene (FokI, BsmI and ApaI) in multiple myeloma patients of Indian population. Journal of Steroid Biochemistry and Molecular Biology 2020; 199: 105588.
[2] Canadian Cancer Society, Multiple Myeloma Statistics 2021. https://cancer.ca/en/cancer-information/cancer-types/multiple-myeloma/statistics#
[3] Lauter B & Schmidt-Wolf IGH. Prevalence, Supplementation, and Impact of Vitamin D Deficiency in Multiple Myeloma Patients. Cancer Investigation 2015; 33:505–509.
[4] Rui H, Liu Y, Lin M, Zheng X. Vitamin D receptor gene polymorphism is associated with multiple myeloma. Journal of Cellular Biochemistry 2020;121:224-230.
[5] Yellapragada SV, Fillmore NR, Frolov A, Zhou Y, Dev P, Yameen H, Ifeorah C et al. Vitamin D deficiency predicts for poor overall survival in white but not African American patients with multiple myeloma. Blood Advances 2020; 4 (8): 1643-1646.

CCNM Patterson Institute for Integrative Oncology Research

UNIVERSITY OF SASKATCHEWAN

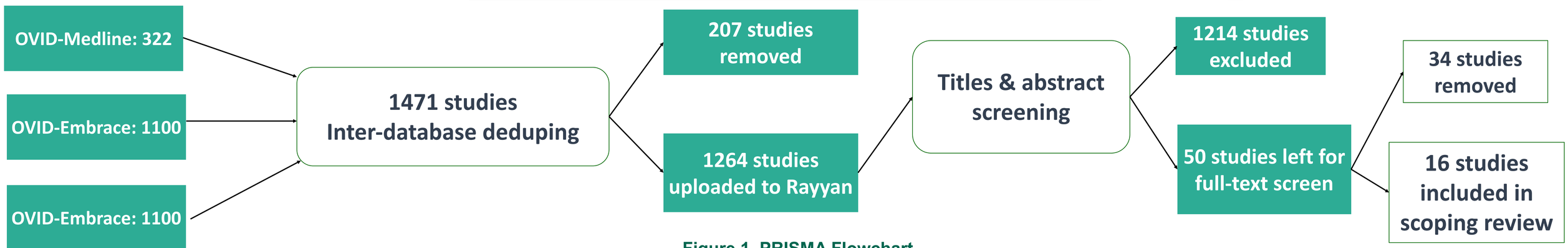


Figure 1. PRISMA Flowchart

Supporting the Well-being of Naturopathic Medical Students: A Pilot Project

Sasha Monteiro, CCNM Student [1], Shakila Mohmand, ND [1] , Lachlan Crawford, ND [1], Teresa Neves, MSW [2], Leslie Solomonian, ND, MPH [1]

1. Canadian College of Naturopathic Medicine, ON, Canada; 2. University of Toronto, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Medical students face a unique collection of stressors, both intrinsic and external, with physical, mental, and behavioral consequences, which ultimately impact quality of patient care.
- The COVID-19 pandemic has led to higher rates of distress, anxiety, and depression for medical students.
- The educational experience plays a large role in the stress of students, highlighting the responsibility of institutions.
- A recently completed scoping review mapping out strategies to improve the well- being of students found benefit through mindfulness, mind-body based programs, curriculum changes and reflection groups.

Objectives

This pilot project aimed to evaluate a program (subsidized by CCNM's student wellness program) designed to support naturopathic medical students in developing strategies to mitigate stress levels and improve resilience and mental health during their training.

Methods

This pilot study was designed as a quasi- interventional study with before-after comparisons among participants, and to a small wait- list control group.

Results

- Participants were asked at baseline and each follow-up to identify the frequency of moderate- vigorous physical activity (MVPA), hours of sleep per night, and consumption of alcohol and other drugs.
  - No significant changes in behavior were found throughout the study. Controls were found to move less and on average than participants and achieve fewer than 7 hours of sleep per night throughout the study period.
- There was a trend toward reduced stress perception and anxiety along with improved resilience among participants compared to controls.

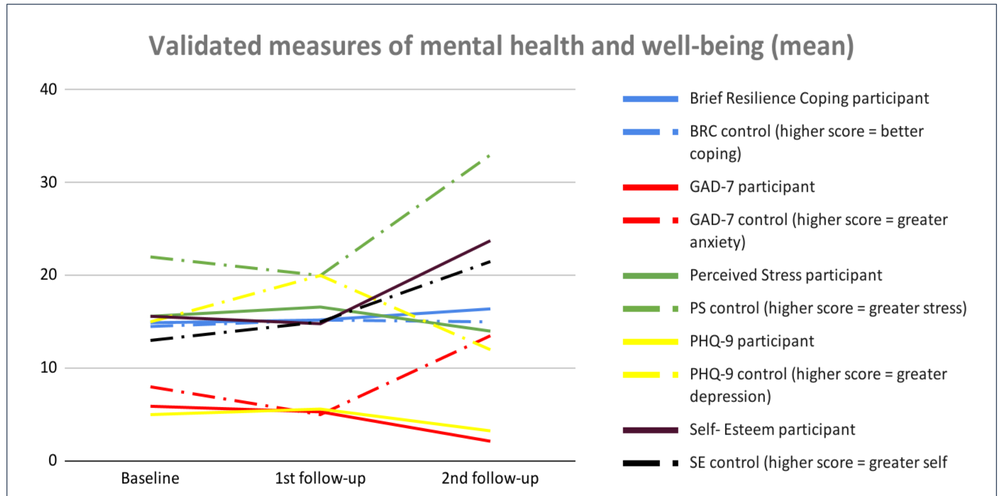


Figure 2. Trends in Validated Measures of Mental Health and Well-being Among Participants and Controls

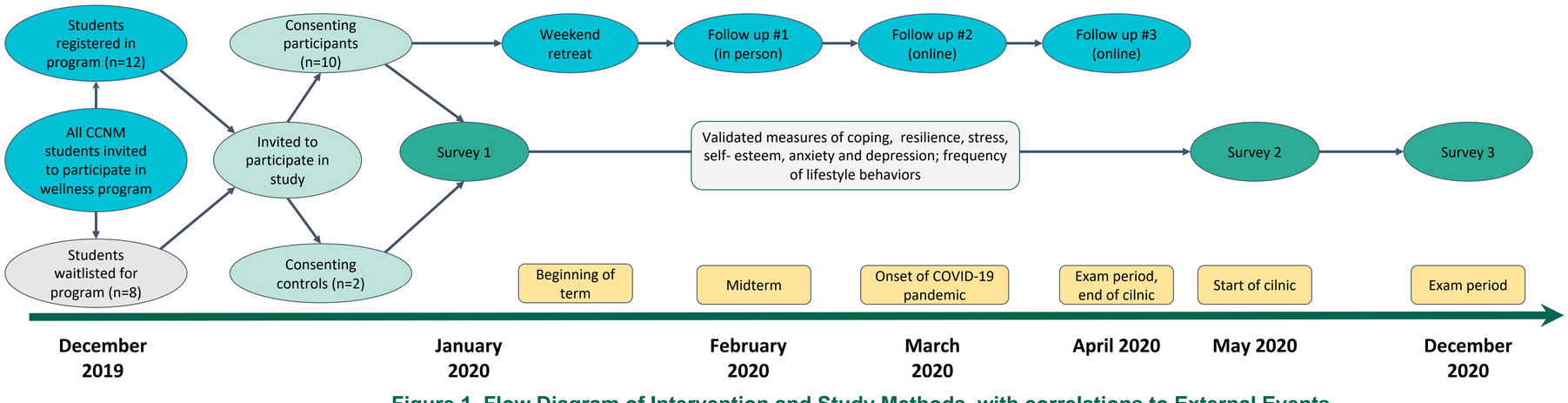


Figure 1. Flow Diagram of Intervention and Study Methods, with correlations to External Events

Discussions

- There was a downward trend in both anxiety and perceived stress among participants over the course of the study, suggesting that the skills nurtured by the program may have buffered the impact of stressors
  - This includes the significant, unanticipated stressor of the COVID-19 pandemic
  - Other studies have shown an increase in anxiety among medical students during the pandemic, which corresponds with the increase in perceived stress experienced by controls.
- These results should be interpreted with caution given the coincidental occurrence of the pandemic as well as the small sample size of both intervention and waitlisted controls.
- Medical students report higher rates of psychological stress than other populations. It is crucial to integrate effective strategies both within and beyond the formal curriculum for students to maintain and/ or improve their resilience and well- being and prevent burnout.

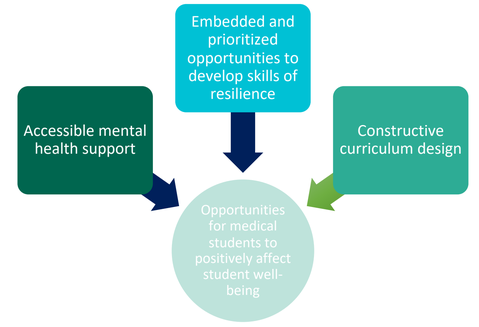


Figure 3. Dimensions of Wellness Promotion Strategies

Conclusions

The results of the study suggest that supporting students in cultivating the skills of resilient coping may reduce perceived stress and improve mental health, even during times of uncontrollable external stress.

For references or further questions, please email: smonteiro@ndnet.ccnm.edu

Treating an HIV+ Patient with Probiotics: A Case Report of *Blastocystis Hominis* Pathogenicity

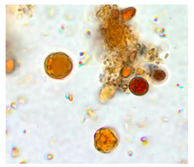
Daniella Remy, MSc, CCNM Student [1], Dr. Gregory Nasmith, ND [1]

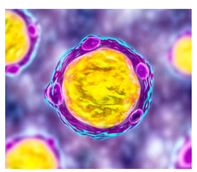
1. Canadian College of Naturopathic Medicine, ON, Canada

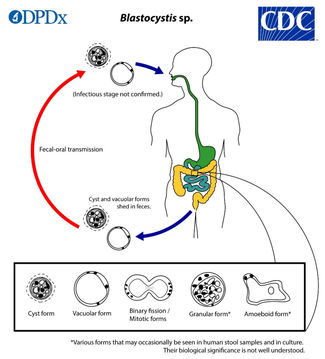
CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Background

- *Blastocystis hominis* is a common anaerobic protozoan parasite in the human gastrointestinal tract that may present with variations in its pathogenicity.
- It has a fecal-oral transmission and has the potential to degrade secretory IgA by secreting cysteine proteases, upregulates IL-8 through NFκB activation, and increases epithelial permeability by disturbing tight junctions and promoting host cell apoptosis.
- Clinical symptoms include nausea, abdominal discomfort, flatulence, watery diarrhea; others can be asymptomatic.
- With a prevalence of up to 35.2% in industrialized countries (up to 100% in developing countries), its pathogenicity might be related to its abundance.
- Genetic variance may also play a role, with 17 genetically distinct human subtypes (ST1–ST17), but ST identification is not common procedure in stool testing.
- It is likely that the cyst stage of its life cycle is when it is infectious to humans, but we still don't know much about its incubation, cyst distribution in feces, or shedding frequency.
- Immunocompromised patients are at higher risk of carrying *Blastocystis hominis* and expressing associated gastrointestinal symptoms.
- Standard of care is not to treat unless symptoms are persistent. Treatment directed at the complete eradication of *Blastocystis hominis* is generally not indicated.







For references or further questions, please email: dremy@ndnet.ccnm.edu

Case Presentation

- A 61 year old male taking Triumeq (abacavir, dolutegravir, lamivudine); he is positive for HIV but his viral load is undetectable.
- June: a multi-strain probiotic and vitamin D treatment for non-digestive concerns were initiated.
- August: Watery diarrhea began, along with new job with a high quantity of fast food, and self-medicating with aloe vera, chlorophyll, and magnesium.
- Healthy eating habits were re-established, self-medications ceased, and 1-2 teaspoons of psyllium husk were recommended to bulk stools.
- September: Watery diarrhea persisted; a stool culture, ova and parasite were requested. Results returned with “moderate *blastocystis hominis* found” with no further details.

Results

- October: A 14-day metronidazole treatment was initiated by his MD, resulting in reduced stool frequency but minimal change in consistency.
- November: A post-antibiotic treatment of 5 Billion CFU *Saccharomyces boulardii* daily was initiated. Bowel movements returned to normal within days.
- December: Bowel movements remain normal, regardless of diet.
- January: Follow-up stool test returned with “few blastocystis hominis found”, all symptoms normal.

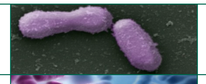
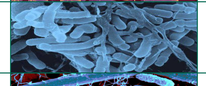
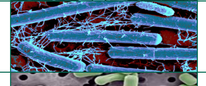
Discussion

- Though extraneous factors prevent a causal relationship to be drawn, it is possible that the quantity of *Blastocystis hominis* reached pathogenic levels when interacting with the *Bifidobacterium longum* contained in multi-strain probiotic.
- *Saccharomyces boulardii* may be effective at regulating bowel movements after a *Blastocystis hominis* infection, following treatment with metronidazole.
- Additional research is needed to better understand interactions with human commensal bacteria.

Conclusions

- The chronic watery diarrhea following probiotic use highlights the importance of becoming familiar with *B. hominis* prevalence and pathogenicity.
- Before recommending probiotics for patients with a compromised immune function, it may be prudent to review possible interactions with *B.hominis* and other commensal bacteria having pathogenic potential.

Table 1. Probiotic interactions with *Blastocystis hominis*

Akkermansia muciniphila		☐	Inverse relationship with ST3 and ST4, but not ST2 (human study)
Bacillus subtilis		☐	Slight increase in *B.hominis* count with co-incubation (mouse model)
Bacteroides fragilis		☐	Slight increase in *B.hominis* count with co-incubation (mouse model)
Bifidobacterium longum		☐	Most significant increase in *B.hominis* count with co-incubation (mouse model)
Lactobacillus acidophilus		☐	Effective in combination with metronidazole and lauric acid (hamster model)
Lactobacillus brevis		☐	Slight increase in *B.hominis* count with co-incubation (mouse model)
Saccharomyces boulardii		☐	Comparable to metronidazole for eradicating *B. hominis* (study on children and mice)

How Do Naturopathic Doctors Define the Quality of Natural Health Products? An Inductive Approach to Establish North American Standards

Daniella Remy, MSc [1], Dr. Adam Gratton, ND [1], Dr. Kieran Cooley, ND [1,2,3,4]

1. Canadian College of Naturopathic Medicine, ON, Canada; 2. University of Technology Sydney, Ultimo, Australia; 3. Pacific College of Health Sciences, San Diego, USA; 4. National Centre for Naturopathic Medicine, Southern Cross University, Lismore, Australia

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Despite the regulations established by Health Canada and the FDA, issues with natural health product (NHP) manufacturing and batch-to-batch variability remain.
- Third party labs will examine the purity and chemical quality of single-ingredient products, but multi-ingredient products have inadequate objective evaluation.
- The assessment of NHP quality throughout North America remains relatively subjective and is prone to personal biases, marketing exposure and convenience.

Objectives

- Identify what subjective and empirical attributes NDs use to define quality NHPs to ultimately develop a measure of NHP quality comparison.

Methods and Sample

- Mixed-methods approach

Data Collection & Participants

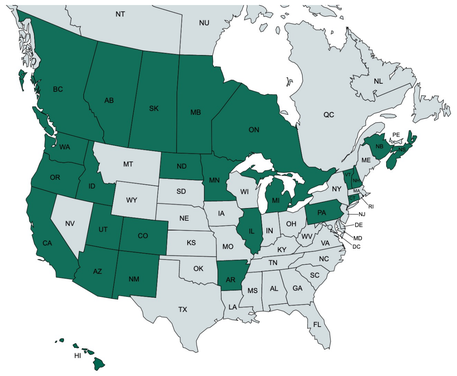
Phase 1

- Interviews with NDs who had a minimum of 5 years of experience, using an inductive approach in grounded theory.
- Out of 67 willing participants, eight interviews were needed to obtain data saturation.

Phase 2

- Anonymous online survey based on Phase 1 results using rank-ordering of themes.
- Out of 322 participants, 309 licensed and practicing naturopathic doctors/physicians in either Canada or the US completed the survey.

Figure 1: Geographic location of participants



Results

- Sourcing, labelling, monographs, and third-party testing emerged as the four main themes to assess quality NHPs, with several sub-themes for each of these.
- For sourcing, participants placed the most importance on adherence to GMP, followed by the inclusion of details of the manufacturing process (ie: cold-pressed, hydrolyzed, etc.) provided on the product label or in the product monograph.
- For labelling, most importance was placed on the inclusion of the active constituents and/or standardized compounds in addition to the amount per capsule/serving, with 47.0% of participants ranking it topmost.
- For monographs, it was deemed important to provide evidence of therapeutic efficacy, including its magnitude of benefit, followed by evidence on dosing, with a clear rationale for the amounts included in the product's formula.
- For third-party testing, verifying that the ingredients match the product label was deemed the most important, with 44.5% of participants ranking it in first place.
- Though nearly half of participants did not feel the geographic location of ingredients or the manufacturer were important, Canada, Australia and Germany were deemed the best countries from which to source natural health products.

Table 1: Ranking of Items that Define Quality Sourcing

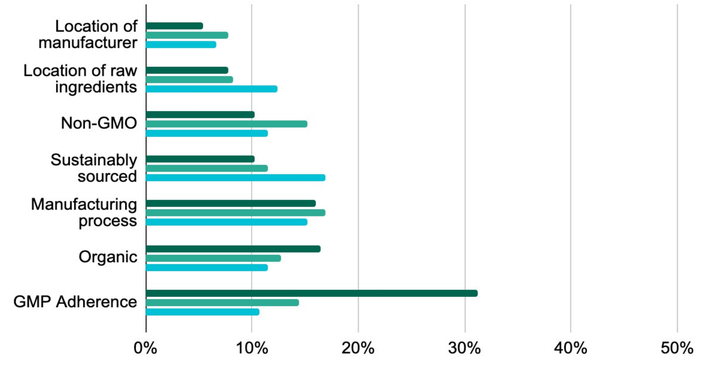


Table 2: Ranking of Items that Define Qualiy Labelling

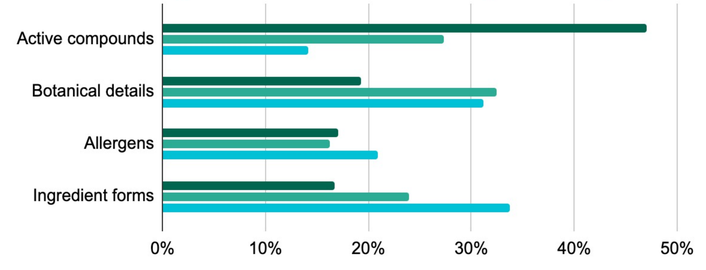


Table 3: Ranking of Items that Define Quality Monographs

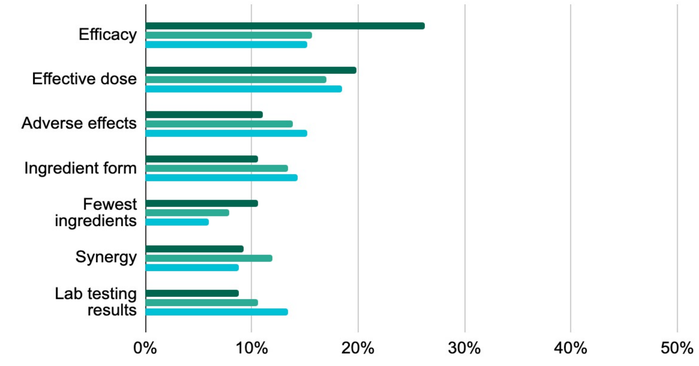
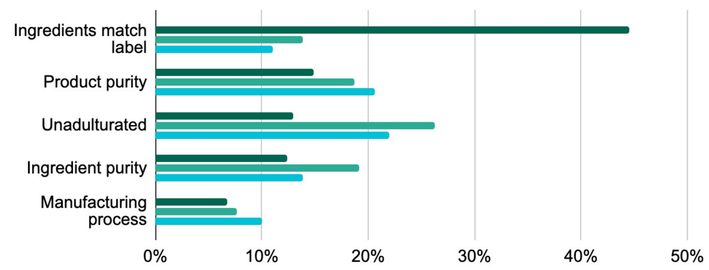


Table 4: Raking of Items that Define Quality Third Party Testing



Legend

- % of participants who ranked the item **First**
- % of participants who ranked the item **Second**
- % of participants who ranked the item **Third**

Discussion and Conclusion

Strengths:

- Rank-order helps distinguish most important from less important factors that define quality.

Limitations:

- Distribution of participating NDs may not be representative of all provinces and states.
- Rank-order surveys can be challenging for respondents.

Future Considerations:

- Using a Delphi technique to refine the findings and develop a quality scoring system through consensus.

Conclusion:

- The ND's selection of NHPs relies heavily on the manufacturing company's reputation and its ability to adhere to GMP and high caliber extraction processes.
- The more transparent an NHP company can be, the more likely the product will be considered of high quality.

Ethics approval:

- Approved by CCNM's REB, including advertising, consent forms, and assurance of confidentiality.

Funding:

- CCNM Student Innovation Fund supported by Biotics Research Inc.

For references or further questions, please email:
dremy@ndnet.ccnm.edu

Investigating the Effect of Green Tea Extract, High Protein Diets and Intermittent Fasting on Weight Loss in Overweight and Obese Adults: A Narrative Review

Evon Salib, R. Kin, CCNM Student [1], Adam Gratton, MSc, ND [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Overweight and obesity is a global health concern with rates increasing worldwide.
- In Canada, 63.1% of adults are classified as overweight or obese.
- Standard care often involves vigorous diet and physical activity interventions that have low engagement and success rates.
- Popular alternative weight loss interventions are commonly advertised and promoted online.
- Overweight and obese populations adopt these popular interventions with little evidence of their effectiveness.

Objectives

To analyze the effectiveness of green tea extract, high protein diets and intermittent fasting as popular weight loss alternatives in reducing weight.

Search Methods

- PubMed was used to search green tea extract AND obesity AND overweight, high protein diet AND obesity AND overweight, intermittent fasting OR time restricted eating AND obesity AND overweight.
- Selected articles were limited to randomized control trials (RCTs), systematic reviews and meta-analyses. Only the RCTs not summarized in the meta-analyses were included.
- Studies that allowed participants to be on anti-obesity medications were excluded.
- Green tea extract studies must have included concentrations of the active component epigallocatechin gallate (EGCG).

Table 1: PICO framework

Population	Intervention vs. Control	Outcomes
Overweight and obese adults	• Green tea extract vs. Placebo • High protein diet vs. Standard protein diet • Intermittent fasting vs. Continuous calorie restriction	Changes in body weight

- Green tea extract yielded 31 studies, high protein diets yielded 596 studies, intermittent fasting yielded 662 studies.

Results

Table 2: Green Tea Extract (GTE)

Authors	Intervention	Comparison	Results
Chen et al., 2016	GTE with EGCG dose of 856.8 mg/d for 12 weeks.	Placebo	Significant weight loss (p=0.025) and reduction in BMI (p=0.018).
Bajerska et al., 2015	Rye bread enriched with GTE, EGCG dose 188.3 or 242.1 mg/d for females and males respectively for 8 weeks.	Placebo (rye bread alone)	No clinically or significantly relevant weight loss was observed between groups.
Mielgo-Ayuso et al., 2014	GTE supplement tid (EGCG dose 300 mg/d) for 12 weeks.	Placebo	Both groups were in 600 kcal deficit. GTE did not enhance weight loss in the intervention group. Both groups had comparable weight loss.
Jurgens et al., 2012*	14 studies with various forms of GTE preparations. EGCG dose ranged from 140-1206.9 mg/d. Durations varied from 80-91 days.	Placebo	Body weight significantly decreased 0.95 kg in the intervention group (p=0.02). Eight of the 14 studies were conducted in Japan. Japanese studies alone found a significant weight loss of 1.44 kg (p=0.02). Excluding Japanese studies, weight loss was statistically non-significant.

Table 3: High Protein (HP) vs. Standard Protein (SP) Diets

Authors	Intervention	Comparison	Results
Campos-Nonato et al., 2017	1.34 g/kg body weight (BW) of protein via soy protein shakes and bars per day for 6 months + 6 month follow-up.	0.8 g/kg BW per day (SP)	HP groups had clinically significant weight loss (7 +/- 3.7 kg) compared to SP group (5.1 +/- 3.6 kg) but was not statistically significant between groups. At 6-month follow-up HP group was more likely to have lost more weight from baseline compared to SP.
Clifton et al., 2009*	Three RCTs on HP diet for 12 weeks.	SP diet	HP vs. SP diets were not found to be statistically significant. Individuals with metabolic disorders on HP diet were more likely to lose more weight compared to SP diet (p=0.01).
Evangelista et al., 2021	30% energy from protein for 12 weeks.	15% energy from protein (SP)	HP lost 3.6 kg and SP lost 2.9 kg. This was statistically non-significant. Clinical relevance is subjective. Individuals with metabolic conditions had better outcomes.
Rolland et al., 2009	40% energy from protein for 3 months.	SP diet	Both groups were consuming a low carbohydrate diet. No difference between HP and SP diets was observed. Both groups had improvements from baseline.
Wycherley et al., 2013	35% energy from protein for 12 weeks.	17% energy from protein (SP)	No statistical significance between the HP vs. SP groups. Individuals with metabolic concerns experienced improved outcomes in metabolic measurements related with fat mass (P<0.001).

Table 4: Intermittent Fasting (IF) vs. Continuous Calorie Restriction (CCR)

Authors	Intervention	Comparison	Results
Enriquez Guerrero et al., 2021*	18 RCTs analyzed for IF with various durations.	CCR	IF groups were more likely to have higher weight loss than CCR groups. IF groups were also more likely to result in less fat mass compared to CCR groups.
Lowe et al., 2020	Eating between 12-8 pm for 12 weeks.	CCR via 3 meals + snacks per day	IF group had significant weight loss of 0.94-1.68 kg (p=0.01) from baseline. Between groups there was no statistically significant weight loss. IF lost 1.17% of BW while CCR lost 0.75% of BW. Clinical relevancy is subjective.
Peeke et al., 2021	14:10 hour window (fasting:eating) for 8 weeks.	CCR via 12:12 hour window	IF group did observe a greater weight reduction from baseline of 10.7 kg while the CCR group had 8.9 kg weight loss. No statistical significance between groups was observed. Weight loss is clinically relevant.
Pinto et al., 2020	Restricted eating for 48 hour periods for 4 weeks.	CCR	Both groups had reduced body weight. IF group lost 2.6 kg and CCR lost 2.9 kg. No statistical significance between groups. Clinical relevancy is subjective.

*Systematic review with meta-analysis

Discussions

Strengths:

- Green tea extract studies were double-blinded, placebo controlled which increased study quality. EGCG dose was included to determine effective dosing.
- High protein diet studies controlled for physical activity and calorie restriction between groups.
- Intermittent fasting studies have the highest magnitude of benefit when physical activity and caloric restriction were controlled.
- All three interventions have little safety concerns.

Limitations:

- Some green tea extract studies limited participant consumption of other stimulatory substances (ie. Coffee) which is not reflective of real-world situations.
- High protein diet studies had variable protein dosing making it difficult to standardize recommendations.
- Intermittent fasting studies did not provide enough information on participant accountability which is a large barrier to success with this intervention.
- Study durations are not enough to create long term weight loss solutions.

Clinical Application:

- Both high protein diet and intermittent fasting studies produced clinically relevant findings when coupled with caloric restriction.
- All interventions can be used in tandem alongside standard care.
- Further research is needed to standardize protein requirements, green tea extract doses and fasting windows for weight loss.

Conclusions

High protein diets and intermittent fasting are viable options to include synergistically with caloric restriction and exercise in the management of overweight and obesity. Green tea extract can be used as an adjunct treatment; clinical benefit may not be observed.

For references or further questions, please email: esalib@ndnet.ccnm.edu

Evaluating N-Acetylcysteine, Inositol and Light Therapy for Bipolar Depression: A Narrative Review

Maya Sankaran, CCNM Student [1], Adam Gratton, MSc, ND [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- In Canada, the lifetime prevalence of bipolar I disorder is 0.87% and of bipolar II disorder is 0.57%.
- Bipolar disorder is the sixteenth leading cause of disability worldwide in all age groups and the sixth leading cause of disability in people aged 10-24.
- The depressive phase of bipolar disorder, bipolar depression is especially challenging to treat due to the potential for antidepressants to induce mania.
- Patients increasingly seek CAM therapies due to treatment-related adverse effects.

Objectives

The purpose of this investigation is to evaluate specific interventions with an evidence base for use with mild-moderate depression to manage bipolar depression.

Search Methods

- Studies were found using PubMed and the Cochrane Library. Articles were limited to clinical trials, meta-analyses, randomized controlled trials, and Cochrane reviews in humans with no restriction applied to the publication date.
- Only studies that included adults diagnosed with bipolar disorder type I or II in a depressive phase, examined N-acetylcysteine (NAC), inositol, or light therapy, had a placebo comparison group for NAC and inositol and sham treatment for light therapy, and reported mean changes in either the Hamilton Depression Rating Scale (HAM-D) or the Montgomery-Asberg Depression Rating Scale (MADRS) were included.
- Meta-analyses with substantial overlap, RCTs already summarized in included meta-analyses, and studies with more than one experimental intervention were excluded from this review.

Table 1: PICO framework

Population	Intervention	Outcomes
• Adults with bipolar disorder I or II in a depressive phase	• NAC • Inositol • Light therapy	• Mean changes in HAM-D or MADRS

Results

Table 2: N-Acetylcysteine (NAC)

Authors	Intervention	Comparison	Results
Nery et al., 2020	NAC: 1-3 g/day	Placebo	Moderate effect size for NAC over placebo; standardized mean difference (SMD) in depressive symptom scores of 0.45 (95% CI: 0.06-0.84, N=248)
Berk et al., 2012	NAC: 2 g/day (1 g bid)	Placebo	No statistically significant difference in MADRS scores between groups; mean MADRS decrease of 0.6 in NAC group (N=76) and 1.5 in placebo group (N=73).
Dean et al., 2021	NAC: 1-2 g/day	Placebo	Placebo more effective than NAC at reducing depressive symptom scores at 3 months (mean difference=1.28, 95% CI: 0.24-2.31, p=0.02, N=58)

Table 3: Inositol

Authors	Intervention	Comparison	Results
Chengappa et al., 2000	Inositol: max dose 12 g/day	Placebo: grape sugar – D-glucose	Statistically significant ($p<0.08$) MADRS score drop after 3 weeks in inositol group (N=12) of 10.6 compared to 5.6 in placebo group (N=12). No statistically significant changes in HAM-D and MADRS between groups after 6 weeks.
Levine et al., 1995	Inositol: 12 g/day (2 tsp bid)	Placebo: glucose 2 tsp bid	No statistically significant difference in HAM-D scores between groups; mean HAM-D decrease of 14.3 in inositol group (N=6) and 14.5 in placebo group (N=2).
Eden Evins et al., 2006	Inositol: max dose 9.5-16.15 g/day	Placebo: lactose	No statistically significant difference in HAM-D scores; mean HAM-D score decrease: 4.11 for inositol (N=9) and 6.38 for placebo (N=8).

Table 4: Light therapy (LT)

Authors	Intervention	Comparison	Results
Lam et al., 2020	400–10,000 lux green or white light	Negative ions or dim light	Small-moderate effect size for LT over control in reducing HAM-D scores (SMD=0.43, 95% CI: 0.04-0.82, p=0.03, N=259)
Yamada et al., 1995	2500 lux white fluorescent light in 1) morning and 2) evening	500 lux dim light in 1) morning and 2) evening	Statistically significant ($p<0.05$) decrease in HAM-D scores in both bright light groups compared to both dim light groups. In participants with bipolar depression, mean HAM-D score reduction of 4.0 from morning light (N=3) and 9.0 from evening light (N=4)
Avery et al., 1998	250 lux white light	2 lux red light	Statistically significant ($p<0.01$) decrease in HAM-D scores in white light group (mean score change: 10.6, N=6) compared to red light group (mean score change: 1, N=6).

Discussions

Strengths: Inclusion of high-quality meta-analyses for NAC and LT interventions, all NAC and inositol RCTs were double-blinded

Limitations: Small sample sizes, inconsistent parameters for LT and dosing for inositol and NAC, differences in medication use criteria, two LT RCTs included a mixed population of participants with bipolar depression and major depressive disorder

Mechanisms of action: Bipolar depression may correlate with low levels of glutathione, impaired oxidative metabolism, low CSF levels of myo-inositol, and circadian rhythm dysregulation.

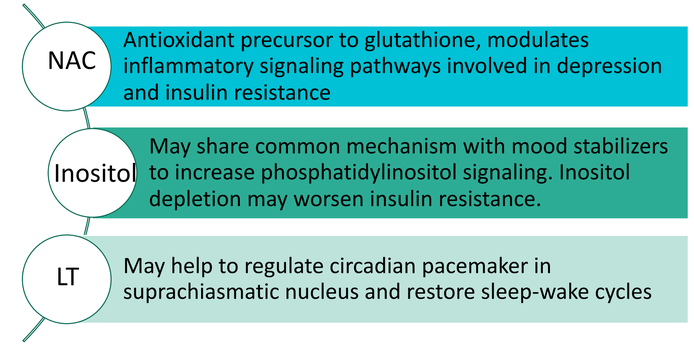


Figure 1. Mechanisms of action of NAC, inositol, and LT

Clinical application: Supplementation with both NAC and inositol could improve metabolic parameters and overall health status, including cognitive and mental functioning in patients with bipolar depression; well-designed clinical trials are needed on this specific therapeutic combination.

Safety: All three interventions were well-tolerated in most studies. NAC and inositol may cause diarrhea, nausea, and indigestion. LT may cause perceived slight early morning awakening and mild headache. Inositol and LT were not associated with increased mania. Dean et al., 2021 found increased manic symptoms in the NAC group compared to placebo after both 2 weeks and 3 months of treatment.

Conclusions

Evidence weakly supports the use of NAC, inositol, and light therapy in the treatment of bipolar depression. Further research of high methodological quality is warranted on the safety and efficacy of all three interventions.

For references or further questions, please email: msankaran@ndnet.ccnm.edu

Naturopathic Medicine and Group Visits: A natural alignment

Leslie Solomonian, ND,MPH;[1] Zeynep Uraz, ND;[1] Shehab El-Hashemy, MBChB, ND, MEd ;[2]Alan Vu, ND;[1] Tori Hudson, ND[2,3,4]

1 Canadian College of Naturopathic Medicine, ON, Canada, 2 National University of Natural Medicine, OR, USA, 3 Bastyr University, WA, USA, 4 Southwest College of Naturopathic Medicine, AZ, USA

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Background

Evaluations of group-based medical/educational visits (GMEVs) identify a number of benefits to disease-, behaviour- and patient-oriented outcomes. Both providers and participants identify greater personal satisfaction and self-esteem associated with participation. This likely translates to cost-savings in the healthcare system through prevention, and the building of participant self-efficacy.

Naturopathic principles appear to align with a group-model of care delivery. Many of the benefits noted in the literature, and experientially by the authors, exemplify the philosophies of naturopathic medicine. We sought to map the benefits of effectively delivered group methods to naturopathic principles.

Methods

We engaged in a scholarly process of consensus building in an attempt to map the benefits (documented in the literature and personally experienced) to the principles of naturopathic medicine (Figure 1). We passed our own experiences through the lens of Kolb's model of experiential and reflective learning, applying Knowle's assumptions of adult learners, and Bloom's taxonomy (Figure 2) of learning to make recommendations for planning and implementing group visits. The facilitator's reflections are described in box A.

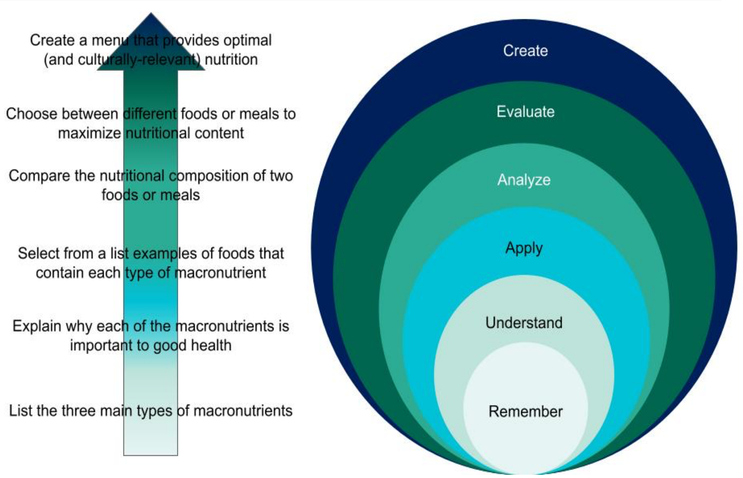


Figure 2. Using Bloom's taxonomy to generate objectives for a nutrition workshop. The resulting activity is described in next box.

Resulting map

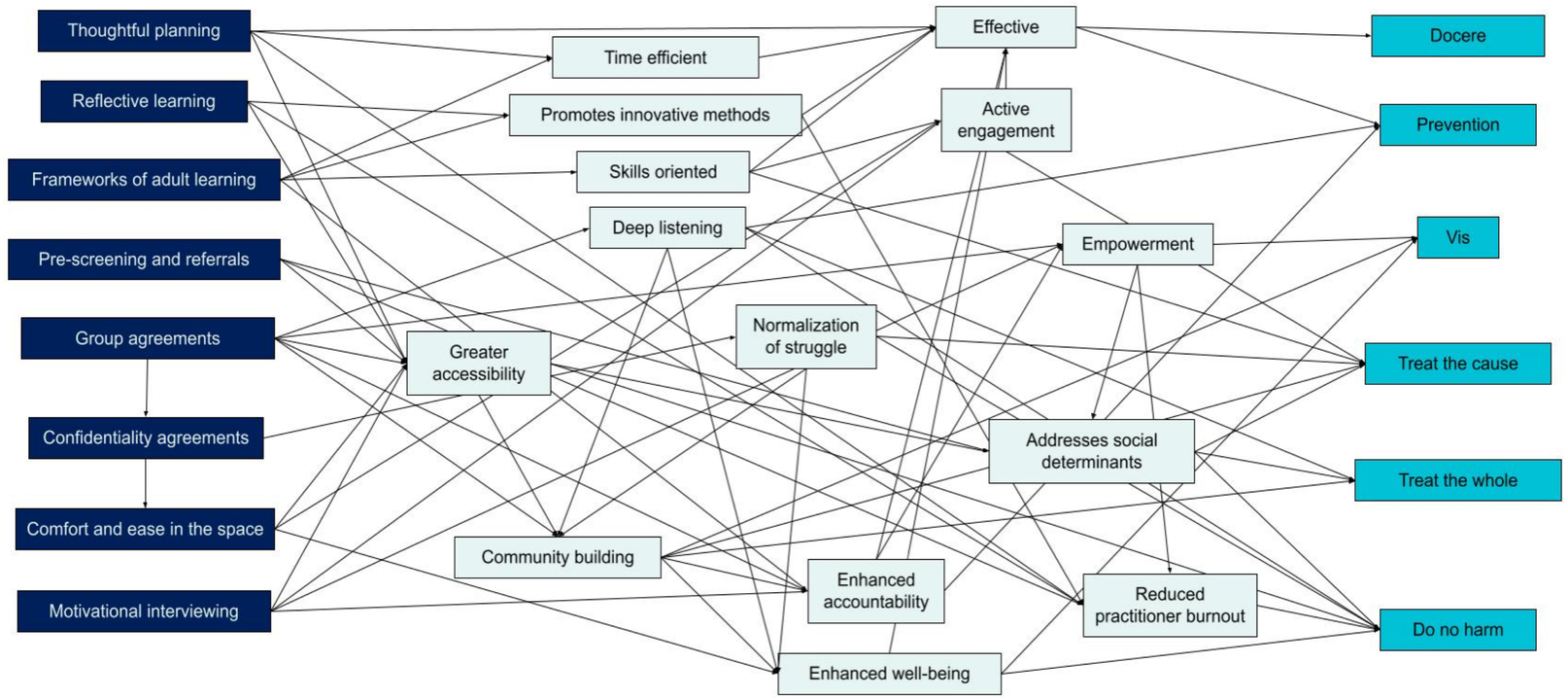


Figure 1: A map linking **evidence-informed strategies** of adult learning to the **benefits** of group-based visits, to the **principles of naturopathic medicine**.

Box A. Facilitator's reflections of resulting activity

For community members who are marginalized, who have low health literacy, or who experience limited access to familiar foods, the principles and practice of basic nutrition can be tricky. This is also a population that is less able to access one-on-one naturopathic care.

I provide a deck of cards containing pictures of a variety of food items, and ask the group to organize the cards in whatever way they choose. We go through multiple rounds of this exercise, to reduce the suggestion that there is a "correct" answer.

When organized by traditional "food groups," we talk about macronutrients. When organized by meals, we discuss strategies of optimizing glycemic load. When organized by colour, we discuss the phytonutrients that optimize micronutrition. At times, the cards have been organized along a continuum of "closer to the earth," which allows conversation about the reciprocal benefits of a plant-forward, minimally processed diet to individual and planetary health.

Doing this activity as a group allows for neutralization of differences in knowledge. Those with more familiarity bring along those with less. As an "expert," I can be flexible with what I reinforce based on what I hear, correcting misconceptions, filling gaps, and - very importantly - affirming what is already known.

What is particularly beautiful about this activity is the way in which multi-cultural groups share what is common in their tradition; how foods are grown or combined; and often - very importantly - where these foods can be accessed in the community.

Conclusions

Naturopathic medicine is beautifully suited to group-based delivery. There is a tremendous gap in health-promotion education in the primary health care system; naturopathic doctors are well-positioned in this domain (*docere*). Group-based care may increase the potential for lifestyle change (*praevenic*), address root causes of disease (*tolle causum*), including psychosocial determinants of health (*tolle totum*) and effectively liberate the individual's natural capacity to heal (*vis medicatrix naturae*).

We recommend that naturopathic medical schools and continuing education programs offer evidence-informed opportunities to develop these skills in order to maximize benefit and minimize harm. We also recommend building capacity in social innovation in order to increase accessibility for all community members.

For references or further questions, please email: lsolomonian@ccnm.edu

Investigating Behavioral and Psychosocial Therapies for the Prevention of Postpartum Depression: A Narrative Review

Lillianne Vogt, CCNM Student [1], Adam Gratton, MSc, ND [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Postpartum depression (PPD) is the most common complication of childbearing affecting up to 28.7% of birth parents.
- PPD may be associated with long-term sequelae for the family and may impair the psychosocial development of the child making it not just a serious disorder but an important public health concern.
- The American Psychiatric Association defines PPD as being a unipolar depressive disorder occurring within 4-6 weeks after giving birth and lasting for at least 2 consecutive weeks.
- In addition to the often-prescribed antidepressants for the treatment of PDD, complementary interventions such as exercise, education programs, and cognitive behavioral therapy have also been used.

Objectives

The purpose of this investigation was to analyze the evidence on the effect of behavioral and psychosocial therapies as prevention for PPD.

Search Methods

Search Strategy:

- databases included PubMed, Cochrane and Google Scholar
- All searches were limited to systematic reviews with meta-analyses and RCTs, humans, English

Inclusion Criteria:

- Only RCTs not summarized in the systematic reviews and meta-analyses were summarized in this review.
- Interventions compared to routine pregnancy healthcare not receiving any intervention using validated PPD scores

Number of studies:

- **Exercise therapy** - 56 studies, of which 2 RCTs and 1 metanalysis met criteria
- **Educational Programs** - 184 studies of which 3 RCTs et criteria
- **Cognitive Behavioral Therapy -** 150 studies of which 2 RCTs and 1 systematic reviews with meta-analyses met criteria

Results

Table 2. Exercise Therapy

Author	Intervention	Comparison	Results
Coll et al., 2019	A supervised 60-minute moderate-intensity exercise 3 times per week for a total of 16 weeks.	The control group were encouraged to continue usual daily activities.	There was no significant mean difference in EPDS scores between the intervention and control groups at 3months post-delivery (p= 0.11).
Songøygard et al., 2012	One weekly 60-minute moderate to high intensity group exercise for a total of 12 weeks and encouraged exercise at home for 45 minutes 2 times per week.	Regular antenatal care.	There were no statistical differences between EPDS scores in the control or exercise group 3 months post partum (p= 0.35).
Poyatos-León et al., 2017	Systematic review looking at exercise therapy as an intervention for PPD.	Standard prenatal care.	Decrases in PPD symptom scores using the EPDS and Beck Depression Index in favor of the intervention group were seen, but statistical differences were not (p = 0.117).

Table 3. Educational Programs

Authors	Intervention	Comparison	Results
Gao et al., 2010	A psychoeducation programme which consisted of two 2-hour sessions following the antenatal education session and one telephone follow up provided within 2 weeks of delivery.	Control group and intervention group received two 90-minute antenatal education sessions.	Mean EPDS scores between groups at 3months post-delivery was NSS. There was a SS reduction in mean EPDS between baseline and at 6 weeks PP in the intervention group (p= 0.000) and between the groups at 6 weeks PP (p= 0.000).
Beydokhti et al., 2021	Five groups of 12 with one session per week which lasted 60 - 90 minutes. A total of four sessions took place over the course of one month.	Regular antenatal care.	There was a significant difference between the prevalence of PPD after the intervention with the intervention group having a prevalence of 6.7% and the control having a prevalence of 34% (p =0.001).
Chabrol et al., 2002	The intervention group received a 1-hour private session between 2-5 days post-delivery at the clinic.	Control group were given a phone number to contact.	At 4-6 weeks postpartum, participants in the intervention group had significant reduction in the frequency of probable depression or having a score ≥11 on the EPDS (p= 0.0067).

Table 4. Cognitive Behavioral Therapies

Authors	Intervention	Comparison	Results
Sockol et al., 2013	Systematic review looking at intervention therapies for the prevention of PPD.	Treatment as usual, placebo, education	Overall, these interventions resulted in reductions in depressive symptoms (g = 0.18) and the prevalence of depressive episodes (OR=0.73).
Rameza ni et al., 2017	cognitive-behavioral counselling groups received a weekly 1.5-hour session for 4 weeks. The solution-focused counselling received three 1.5-hour sessions for 3 weeks.	Regular antenatal care.	The mean PPD scores at 15 days post-delivery were significant between intervention groups and control; however, the PPD scores were not significantly different between the cognitive-behavioral and solution-focused interventions.
Ngai et al., 2020	A 3-hour antenatal group session and two 30 minutes follow up sessions on the phone within the first month PP.	Standard perinatal care.	The differences between mean PPD scores of mCBI and control at 6 weeks, 6 months, and 12 months PP was NSS (p = 0.39, p= 0.94, p =91, respectively).

Key: NSS: not statistically significant; SS: statistically significant; PP: postpartum

Discussions

- Evidence suggests educational programs and CBT can be used for the prevention of PPD.
- Exercise therapies do not appear to be significantly effective for the prevention of PPD.

Limitations

- Some studies failed to obtain both a EPDS baseline and post-test score which compromised the ability to directly compare efficacy of the intervention
- Some studies failed to screen and exclude currently depressed pregnant people thus not ensuring the validity of their prevention study
- Small sample sizes, significant heterogeneity and potential publication bias threaten the validity of the studies consulted

Implications

- The results could help healthcare professionals with designing and implementing effective strategies to prevent PPD and address mental health concerns

Future Studies

- Future studies could investigate the role of diet and/or nutraceuticals in preventing PPD
- Future studies could also investigate the influence of being supported by a significant other in the prevention of PPD
- Future studies could investigate the role of spending time in nature for the prevention of PPD

Conclusions

Evidence suggests that educational programs and CBT can be used for the prevention of PPD. However, exercise does not show significant benefit in the prevention of PPD. Substantial heterogeneity exists between studies and thus warrants further research.

The authors declare that they have no conflict of interest.

For references or further questions, please email: lvogt@ndnet.ccnm.edu

Effects of Outdoor Learning School-Based Education Programs on Pediatric Health: A Systematic Review

Mariah Wilson, BHK, CCNM Student [1], Domenique Barbaro, BSc, CCNM Student [1], Racheal Onah, BSc, CCNM Student [1], Zack De Rose, BASc, CCNM Student [1], Leslie Solomonian, ND, MPH (FCM) [1]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

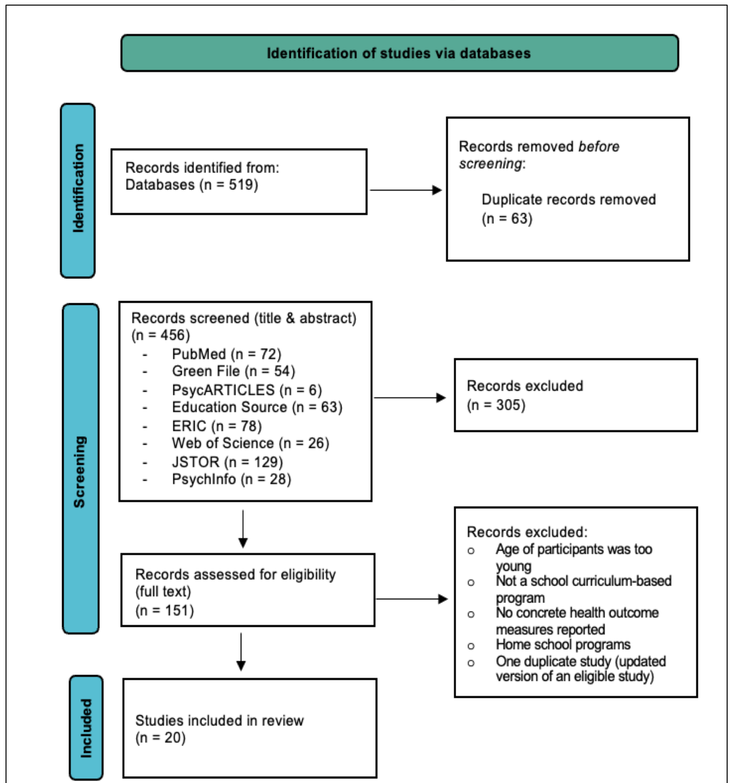
Nature prescribing in an educational setting is a key strategy to address health. Outdoor education can help prevent chronic physical and mental conditions, as well as long-term sedentary habits. It is a proactive and sustainable approach to pediatric health and can directly benefit the healthcare system financially by relieving the burden the system faces from chronic illness.

Objectives

This review aims to identify the impact of outdoor education with school- or curriculum-based activities on the physical, cognitive, social, affective, psychological, and behavioral outcomes among children participating in curriculum-based outdoor education.

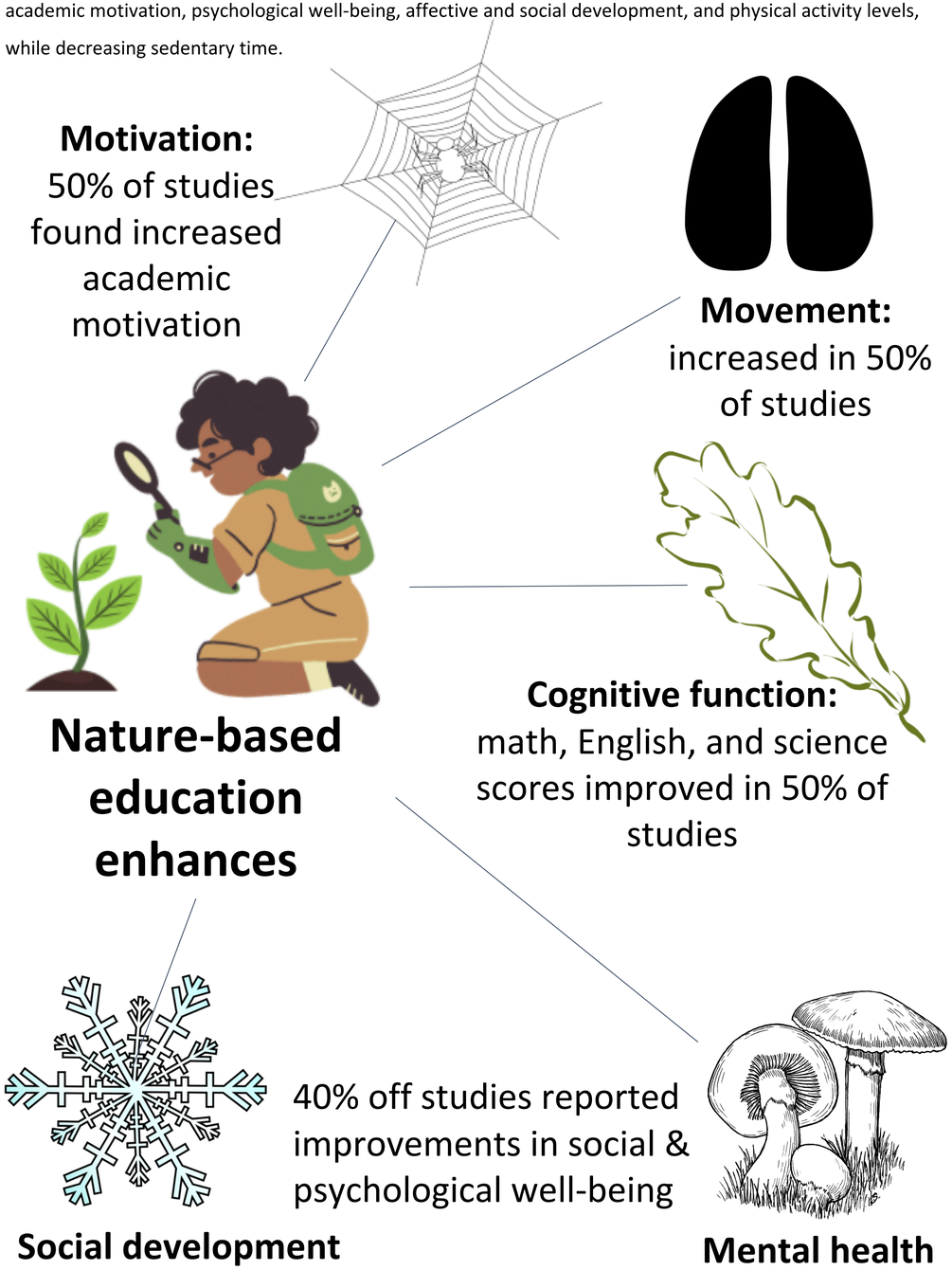
Methods

Table 1: PRISMA diagram



Results

Figure 1: Outdoor Learning Program Benefits; improvements were found in children's intellectual development, academic motivation, psychological well-being, affective and social development, and physical activity levels, while decreasing sedentary time.



Discussions

Children who participate in curriculum-based outdoor learning can improve in intellectual/cognitive development, social skills, psychological well-being, and physical activity. Regardless of the duration and type of outdoor education, learning outdoors can have a beneficial role in children's development and wellbeing.

Barriers implementing nature-based outdoor-education programs include: concern over the health and safety of children, teachers' lack of confidence in teaching outdoors, and lack of time, resources, weather, and support.

Healthcare providers can provide support by advocating for policy changes that reduce these barriers, including prioritizing funding to implement opportunities and infrastructure for education outside the classroom. Even small changes can harness the benefits of outdoor play, such as selecting naturalized play environments over equipment-based playgrounds and paved areas.

This review can serve as inspiration to influence widespread funding and implementation of learning strategies that support all children in strengthening their connection to nature and to one another. Not only does this seem to benefit their health during childhood, but also into adulthood.

Conclusions

School- and curriculum-based outdoor programs may have a beneficial role in the wellbeing and quality of life for children. These results support further research into the application of school- and curriculum-based outdoor-education programs to improve intellectual, social, physical, psychological, and health-related outcomes.

For references or further questions, please email: mwilson@ndnet.ccnm.edu

Naturopathic management of acute pediatric respiratory infections: A modified Delphi study

Leslie Solomonian, BSc, ND, MPH [1], Jamine Blesoff, ND [2], Luciano Garofalo, ND, MS [3], Sandra Lucas [4], Andrea Picardo, HBSc, ND [1], Anna Garber, H.BSc, MSc, ND [1], Mariah Wilson, BHK [1], Matthew Leach, RN,ND,BN,BN(Hons),PhD [5]

1. Canadian College of Naturopathic Medicine, ON, Canada, 2. National University of Health Sciences, IL, USA, 3. National University of Natural Medicine, OR, USA, 4. School of Health Sciences, University of South Australia, Australia, 5. National Centre for Naturopathic Medicine, Southern Cross University, Australia

CCNM CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

The United Nations and The World Health Organization have acknowledged that antimicrobial resistance is a significant threat to global health. The Centers for Disease Control and Prevention (CDC) identified five pediatric respiratory conditions under close inspection in terms of antibiotic stewardship. We theorize that naturopathic strategies safely fill the gap between watchful waiting and antibiotic prescription, thus appropriately reducing the use of antibiotics.

Objectives

To identify strategies used by experienced naturopathic practitioners in the management of the five acute pediatric respiratory infections (APRIs: acute otitis media, rhinitis, pharyngitis, bronchiol/ bronchitis, and pneumonia) prioritized by the CDC.

Methods

Naturopathic practitioners in Canada, the United States, and Australia were recruited for a modified Delphi study. A 14-person panel completed a series of four iterative surveys (figure 1) assessing agreement to statements in five domains (knowledge/attitudes, assessment/ diagnosis, management, monitoring, and education).

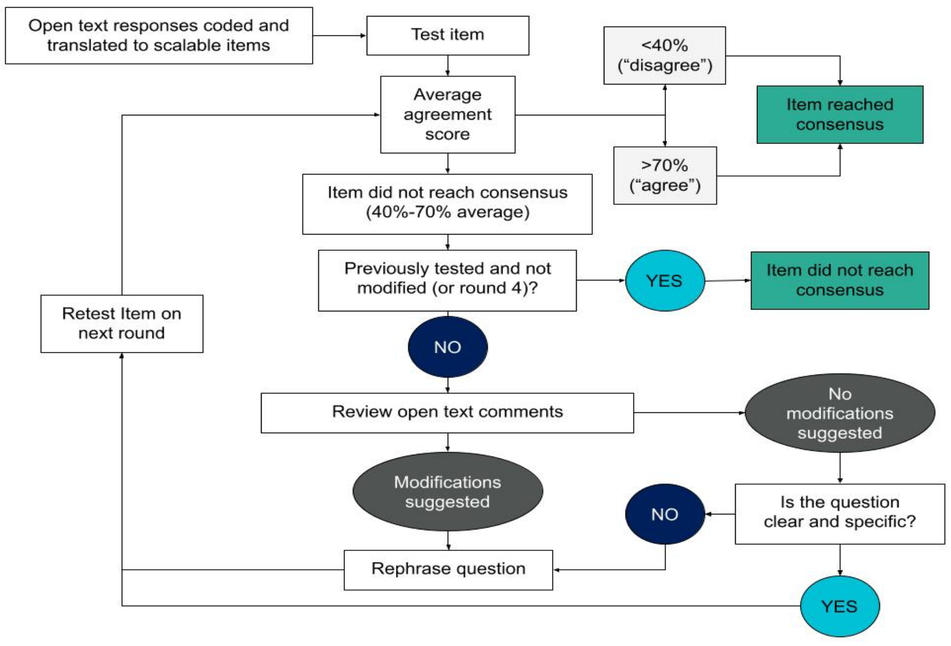


Figure 1: Flow diagram; items that achieved greater than 70% or less than 40% agreement were deemed to have reached consensus. Items between these thresholds were modified and/or retested until consensus was reached or the four surveys had been completed.

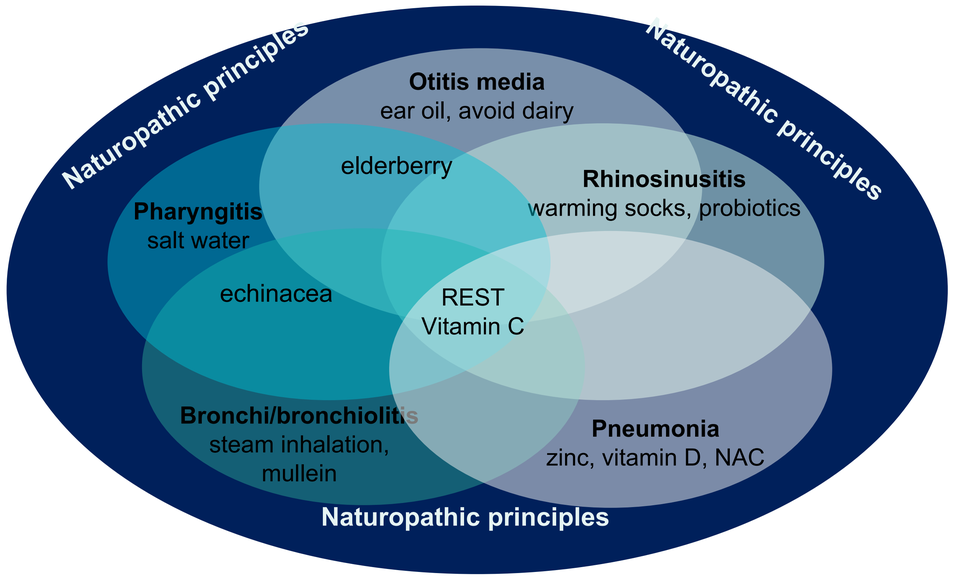


Figure 2: Interventions reaching greatest consensus for each condition; results in other domains emphasized naturopathic principles, especially treating the individual, and engaging the *vis*

Key results

Clinical Decision Making

Naturopathic practitioners appeared to use a limited range of knowledge resources to inform their decision-making regarding the management of APRIs, with consensus reached on clinical experience and child/guardian history. Practitioners also emphasized the importance of treating people individually, not exclusively relying on guidelines.

Diagnostic Techniques

Non-specific diagnostic techniques, such as a child's behavior, appearance or body temperature, reached consensus for all conditions, while procedures more specific to certain APRIs tended to reach consensus where expected. Diagnostic strategies more aligned with conventional biomedical assessment approaches were more likely to reach consensus, vs. those that originate in other medical paradigms, such as spinal assessment, tongue and pulse evaluation, or electrodermal testing.

Interventions

Lifestyle strategies achieved the greatest degree of consensus, such as rest (which reached 100% consensus), increasing nutrient-dense foods, avoiding sugar, and limiting dairy. Of the non-lifestyle recommendations that achieved consensus, vitamin C and D, elderberry (Sambucus nigra fructus) and echinacea (Echinacea spp.) were the most commonly used. Licorice (Glycyrrhiza glabra), marshmallow (Althaea officinalis), and mullein (Verbascum thapsus) also reached consensus for specific conditions. Some modalities that did not reach consensus, such as spinal adjustments and acupuncture, are perhaps being deprioritized in favor of herbs.

Discussion

A common sentiment from the survey was that antibiotic therapy were unnecessary, potentially harmful, and thus should be preserved for only the most severe presentations, or after naturopathic approaches are implemented. Among the participants, antibiotics were rarely prescribed. This may suggest that NDs are seeing APRIs and successfully managing them using naturopathic approaches before they become severe enough to require more intensive investigation and intervention.

Most of the interventions that achieved the greatest consensus appear to have a reasonable base of evidence for their safety and effectiveness for these conditions.

Given the finding that participants did not routinely access research evidence in their management, (evidence) it may be important to reinforce standard guidelines in naturopathic training and continuing education to ensure naturopathic practitioners are using evidence-informed processes in their care of children.

Conclusions

Results of this study could be significant for the purposes of a) communicating to other health care providers the role that naturopathic doctors can play in the management of pediatric health concerns and the stewardship of antibiotics; and b) provide initial guidance to less experienced naturopathic practitioners. It may inform observational and/or whole systems research with an eye to establishing evidence for the safety and effectiveness of naturopathic intervention to reduce the use of unnecessary antibiotics.

For full data set, references or further questions, please email: lesliend@gmail.com

Maternal Fiber Intake and Perinatal Anxiety and Depression: A review

Tiffany Turner, ND [1], Rebecca Lester, CCNM student [2], Sholeh Ghayoori, CCNM student [2], Neda Ebrahimi, PhD [2]

1. Canadian College of Naturopathic Medicine, BC, Canada; 2. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

The importance of maternal nutrition on pregnancy, neonatal and long-term infant health outcomes have long been acknowledged. The association between maternal mental health and antenatal diet, however, remains underexplored, particularly in the context of fiber intake. The role of the gut microbiome in psychiatric outcomes through the bidirectional communication of the Gut-Brain Axis, and the effect that indigestible carbohydrates have on gut microbiota and subsequently derived metabolites, calls for a closer investigation on fiber's role in mental health disorders, especially in the pregnant population.

Objectives

To investigate the association between fiber intake and maternal anxiety and depression during the perinatal period.

Search Methods

A literature review of PubMed and Google Scholar using the keyword/MeSH terms in Table 1 was conducted. Observational and clinical trials published since 2015 with pregnant and/or breastfeeding/postpartum women and with outcomes for anxiety or depression were included. Reviews, meta-analyses, and animal studies were excluded. Article titles and abstracts were screened independently and data on diet, mental health outcomes and demographic factors were extracted.

Table 1. Keyword/MeSH Terms

Fiber		Mental Health	Context
Diet	Inulin	Mental Health	Antenatal
Nutrition	Oligofructose	Anxiety	Pregnancy
Dietary Pattern	GOS	Depression	Postpartum
Diet Quality	Galactooligo-saccharide	Mental Health	Perinatal
Fiber/Fibre		Well-being	peripartum
Prebiotic	Xylooligo-saccharides	Mood	Maternal
Oligosaccharides	Vegetables	stress	Gestational age
complex carbs	Fruits	psychological	lactation
prebiotics	Whole Grains	status	breastfeeding
Diet therapy	Legumes/Pulses/	Dysthymia	
synbiotic	Beans	baby blues	
FOS	fiber/fibre		
Fructooligo-saccharides	supplements		
	Vegetarian		

Results

Analysis is currently in progress. A total of 22 studies were included, however some report only on dietary diversity, micronutrient, or macronutrient composition. If supplementary data cannot be obtained for these studies they will be excluded, as fiber content cannot be assessed from the information currently available. The included studies are from nine countries (Table 2).

Table 2. Characteristics of Included Studies

Country	Study #	National Fiber Guideline	Fiber Sources Reported (Fruits, Vegetables, Legumes, Grains)	Mental Health Outcome	Screening Tool	Assessed Prenatal/ Post-partum
Australia	8	-	F, V, L, G	Depression	EPDS	Pre & Post
	14		In progress	Depression	EPDS, SCID-IV	Pre & Post
	15		F, V, G	Depression	EPDS	Pre & Post
	25		In progress	Depression	CES-D	Post
Brazil	1	-	F, V, L, G	Anxiety	STAI	Pre & Post
	6		F, V, L, G	Anxiety, Depression	PRIME-MD-PHQ	Pre & Post
China	10	-	-	Anxiety, Depression	SAS, SDS	Pre & Post
	12		F, V, G	Depression	EPDS	Post
	20		F, V, L, G	Depression	SDS	Post
	21		F, V, G	Depression	EPDS	Post
	24		In progress	Depression	SDS	Pre
Iran	11	-	-	Depression	EPDS	Post
	13		-	Depression	EPDS	Post
Japan	3	≥18 g/day (non-pregnant)	F, V, L, G	Depression	CES-D	Pre
	18		F, V, L, G	Anxiety, Depression	SF8-HRQOL	Pre
Pakistan	27	-	F, V, L, G	Depression	EPDS	Pre
Singapore	5	-	F, V, L, G	Anxiety, Depression	STAI, EPDS	Pre & Post
	23		In progress	Anxiety, Depression	STAI, EPDS	Pre & Post
USA	16	25-36 g/day (depending on age, trimester)	F, V, G	Depression	PHQ-9	Pre
	17		F, V, G	Depression	PHQ-9	Pre
	28		In progress	Depression	CES-D, PHQ-2	Post
Vanuatu	22	-	-	Anxiety, Depression	K-10 Distress Scale, CES-D	Pre

Discussion

Relation to Previous Research

- In Canada, symptoms associated with postpartum depression and anxiety have an estimated prevalence of 17.9% and 13.8% respectively.
- Globally, the prevalence of postpartum depression has been estimated at 17.22%.
- Dietary patterns have been associated with depression and anxiety. In addition, suggested mechanisms for associations between depression and obesity include hyperactivation of the hypothalamus-pituitary-adrenal (HPA) axis, dysregulation of cortisol levels, and chronic inflammation. In turn, obesity has been associated with alterations in intestinal microbiota composition.
- Recent studies have also shown correlations between presence of and changes in microbial genera and diagnoses of major depressive disorder and general anxiety disorder.
- Dietary fiber has been recognized worldwide as an important staple of a healthy diet, yet most countries report inadequate fiber intake.
- High intake of dietary fiber may contribute to reduced risk and severity of depression through lowering the incidence of obesity and impacting gut microbiota, resulting in decreased intestinal membrane permeability, inflammatory response, and proinflammatory cytokines.

Relation to Future Research

- Results of this review will be used to inform the protocol of a clinical trial on this topic.

Conclusions

Results from this study will help inform the present understanding of the role of fiber in perinatal mental health disorders, and lay the groundwork for investigating maternal gut microbiome, diet, and mental health outcomes.

For references or further questions, please email: tturner@ccnm.edu

Tarentula Hispanica in the Treatment of Long-Term Restless Leg Syndrome: A Case Report

Umut Uzunel, CCNM Student [1], Erin Truscott-Brock ND [1]
1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

- Restless legs syndrome (RLS), also known as Willis-Ekbom disease
- Common multifactorial neurological condition
- Possible explanations of the disease include iron deficiency and abnormally high brain dopamine levels
- No scientific evidence to show the efficacy of homeopathic remedies on RLS

Objectives

- The aim of this case report is to show the effect of Tarentula Hispanica in long-term restless leg syndrome with possible dopamine imbalance

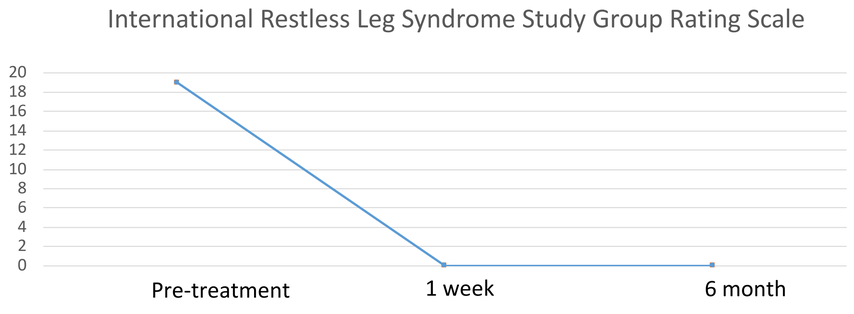
Case Presentation

- A 73-year-old Caucasian female, retired healthcare professional
- RLS,arrhythmia,hypertension, hypercholesterolemia, hyperhidrosis and knee pain
- Taking pramipexole (dopamine agonist) 0.25 mg once, sometimes 0.50mg before bedtime for 11 years for RLS
- Rosuvastatin for hypercholesterolemia for 21 years
- Metoprolol for arrhythmia for 16 years
- Taking 400 mg magnesium inconsistently for a few months when she came to her first visit
- Whenever she forgot to take pramipexole, her RLS symptoms were aggravated at night that she couldn't sleep without taking the medication

Results

- Recommended to take tarentula hispanica 200 CH two pellets before bedtime for 3 days instead of pramipexole
- Her RLS symptoms disappeared completely after taking tarentula hispanica on the first day, and she was very surprised as it had never happened in the last 11 years. She continued to take the remedy the following 3 days, then she discontinued.
- She has only had a mild burning sensation in her feet, this was improved with hydrotherapy, but it didn't affect her sleeping quality.
- International Restless Leg Syndrome Study Group Rating Scale was used to assess the severity of symptoms that were 19 (moderate) before and 0 (none) both in the first week and 6 months after the remedy.

Recommendations	Daily dosage	Reason
Omega-3	1500 mg EPA 1000 mg DHA	Support cardiovascular health
Relora (Magnolia officinalis and Phellodendron amurense)	300 mg	Regulate sympathetic system activation to decrease hyperhydrosis
Vitamin B complex	L-theanine 200 mg, B1 100mg, B2 100 mg, B3 100 mg, B5 200 mg, B6 50 mg, B7 500 mcg, B9 1000 mcg, B12 1000 mcg, Choline 200 mg, inositol 200 mg, spirulina 120 mg	Improve cholesterol metabolism Supportive for aging process and memory
Tarentula Hispanica	200 CH	Improve RLS



Discussions

- Animal and human studies show the roles of iron and dopamine in RLS.
- Dopamine agonists are mainly used to control the symptoms; however, they have side effects, such as augmentation, dizziness, drowsiness, nausea, or headache.
- In the present case, the patient had had RLS symptoms for 11 years, controlled with a dopamine agonist. Although there were no remarkable side effects, she had hyperhidrosis that happened morning as soon as she woke up and she soaked that needed to change her clothes. It may show sympathetic system dysregulation that dopamine agonists can cause.
- Non-pharmacological interventions, such as repetitive transcranial magnetic stimulation, exercise, compression devices, counterstrain manipulation, infrared therapy, acupuncture, vibration pads, cryotherapy, yoga, which may improve some sleep-related outcomes and decrease the severity of symptoms in RLS. Unfortunately, there are no scientific studies to show the effect of the homeopathic remedy in patients with RLS.
- The limitations of the current case report are usage of magnesium and acupuncture applications and lack of scientific evidence of homeopathic remedies. Even though she didn't take magnesium bisglycinate regularly, it can alleviate symptoms, similar to acupuncture. However, in this case, improvement happened in one day as expected in homeopathic treatment compared to magnesium supplementation or acupuncture.

Conclusions

This case illustrates that dopamine agonist is beneficial for RLS but carrying the risks of side effects. A homeopathic remedy can be also helpful without having any known side effects. In this case, Tarentula Hispanica was fully effective for discontinuing the long-term medication.
Further clinical studies are required.

For references or further questions, please email: uuzunel@ndnet.ccnm.edu

Hot and cold theory: a bridge from the past to the future

Maryam Yavari, MD(IMG), PhD, ND[(1)]; Paul Richard Saunders, PhD, ND, R HOM, DHANP, CCH [(1)]

1. Canadian College of Naturopathic Medicine, ON, Canada

CCNM
CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

The hot and cold theory represents the dynamic state of health and disease for each individual.

This concept is a fundamental pillar of traditional medicines (TMs) all around the world, while it is discarded in conventional medicine.

Objectives

The goal of this project was to define the theory of hot and cold based on different TM systems, and assess the scientific evidence for this concept.

Search Methods

- Thirty-one scholars contributed to this project.
- Four groups worked on traditional Chinese, Persian, Ayurvedic and South American and Caribbean medicines. They assessed foundational references of each TM field which were selected based on expert opinion, as well as electronic databases in both the native language of each TM and English (Table 1).
- The other four groups of scholars performed narrative reviews on scientific evidence in four areas of nutrition, pharmacology, physiology and systems biology for the theory of hot and cold.

Table 1. Summary of search strategy for traditional medicine groups

Traditional Medicine	Researchers	Keywords/Databases
Chinese Medicine	*Katayoon Keyhanian*	▪ Cold/heat with yin/yang or Qi, cold/heat with pattern differentiation, cold/heat with treatment, cold/heat with acupuncture, history of Chinese medicine, philosophy of Chinese medicine, the concept of Qi, yin/yang, five elements, pathogenic factors in Chinese medicine. ▪ PubMed and Google Scholar, Traditional Chinese textbooks
Persian Medicine	*Mojgan Tansaz, Mahshid Chaichi-Raghimi, Shahpar Kaveh, Farooq A. Dar, Morteza Mojahedi*	▪ Mizaj identification, hot, cold, temperament, Mizaj, Persian Medicine, Humoral medicine, Unani medicine ▪ PM textbooks, including Al-Qanun fi al-Tibb (The Canon of Medicine), Kamil al-Sinaa al Tibbiyah, Liber Al-Mansuri, Hedayat al Mota'allemin fi al-Tibb, and Kholasat al-Hikmah. ▪ Cochrane, Web of Science, Science Direct, Scopus, PubMed, Google scholar, SID
Ayurveda	*Sanjeev Rastogi, Ram Harsh Singh*	▪ Ushna, Sheeta, Ushna Guna, Sheeta Guna, Ushna Virya, Sheeta Virya. ▪ Three major classics of Ayurveda (Brihat Trayi), namely, Charaka Samhita, Sushrut Samhita, and Ashtanga Hridaya. ▪ Three minor classics (laghutrayi), namely, Madhva Nidan, Bhava Prakash, and Sharangadhar Samhita. ▪ PubMed, Google Scholar, AYUSH research portal. (Keywords for electronic search: Hot, cold, Ayurveda)
Latin American and Caribbean Medicine	*Carlos A. Vásquez-Londoño, Luisa F. Cubillos-Cuadrado, Andrea C. Forero-Ozer, Paola A. Escobar-Espinosa, David O. Cubillos-López, Daniel F. Castaño-Betancur*	▪ PubMed, Scopus, Biblioteca Virtual en Salud, Redalyc, Scielo databases. ▪ Hot and cold AND medicine AND Latin America, hot and cold AND medicine AND South America, hot and cold AND medicine AND Central America, hot and cold AND plant AND Latin America, hot and cold AND plant AND South America, hot and cold AND plant AND Central America. ▪ All available books regarding Latin American and Caribbean traditional medicines.

Results

- The spectrum of hot and cold represents the state of body balance which is affected by genetic, lifestyle, and environmental factors.
- Based on research studies, individuals with hot or cold temperaments are different in neuro-endocrine-immune system's balance, metabolism rate, and expression of genes/biological pathways.
- The hot and cold nature of foods and herbs seems to be associated with their effects on body metabolism, autonomic nervous system balance, oxidation potential, vasodilatory and pro-inflammatory properties, effects on inflammation and immunity-related genes, and phytochemical content.

Discussions and Conclusions

- The definitions and beliefs about hot and cold theory in four TM systems and the available scientific evidence for this theory were presented in this project.
- This theory implements a holistic approach in which the state of health is different for one person than another. Therefore, preventive and treatment methods should be tailored to each individual.
- It is postulated that hot-cold classification is capable of predicting the omic patterns that will be the pillars of personalized medicine. This opens a new horizon in bridging these old traditional concepts to the future of medicine.

Limitations

The hot-cold concept is part of other TM systems such as European traditional medicine, Korean medicine, Iban medicine and Japanese medicine which were not included in the current project due to our limited access to resources and experts in these fields.

Strengths

This project has linked the core concept of hot and cold in different traditional healthcare systems beyond the boundaries of the countries, cultures, and languages; and has evaluated the scientific evidence for it from different scientific disciplines' angles such as physiology, pharmacology, nutrition and molecular biology.

Clinical Application

Although still in the phase of research, treatment modalities such as pharmaceuticals, herbs, food therapy, hydrotherapy and more can potentially be interpreted based on this fundamental theory. Based on the current studies, this approach has the potential to be integrated into conventional medicine protocols for preventive, diagnostic, treatment and rehabilitation purposes.

Reference

Yavari M. Hot and Cold Theory: The Path Towards Personalized Medicine. Springer. 2021.

For references or further questions, please email: psaunders@ccnm.edu, myavari@ccnm.edu

A Review of Systems Biology Studies on the Hot-Cold Theory

Farideh Bahari, MS, PhD candidate[1]; Maryam Yavari, MD(IMG), PhD, ND[2]

1. Pasteur Institute of Iran, Tehran, Iran. 2. Canadian College of Naturopathic Medicine, ON, Canada.

CCNM CANADIAN COLLEGE OF NATUROPATHIC MEDICINE

Introduction

Many studies have investigated the biological foundations of the "Theory of Hot and Cold", a mutual concept in traditional medicines (TM). This narrative review has gathered and assessed available studies which used omics techniques and systems biology approaches in order to better understand the concept of hot and cold.

Objectives

- Assessment of genes that play a role in hot and cold classification in different TMs.
- Determine the common genes with overlap between at least two TMs.
- Evaluation of KEGG pathway and biological process gene ontology (GO) terms for the common genes.
- Interpretation of the link between these pathways and TM concepts of hot and cold.

Search Methods

Using the keywords listed in table 1, systems biology articles about the theory of hot and cold in different TMs, including traditional Chinese medicine, humoral Persian medicine, Ayurveda, Latin American and Caribbean Medicine, and Sasang constitutional medicine, were reviewed and summarized and common genes among the investigated TMs were selected for further analyses.

Table 1: Keywords, tools and databases used in the study

Keywords	systems biology, traditional Chinese medicine, hot and cold, Yin and Yang, Zheng, Vata, Pitta, Kapha, systems pharmacology, temperament, Mizaj, constitution, Tridosha, Iranian traditional medicine, Persian medicine, machine learning, Korean medicine, Sasang, Latin American medicine, Caribbean Medicine, Ayurvedic Medicine, traditional medicine
Web-based tools/ databases	**Enrichr:** http://amp.pharm.mssm.edu/Enrichr): an enrichment analysis web-based tool **Kyoto Encyclopedia of Genes and Genomes (KEGG):** (http://www.kegg.jp/) used for determining the KEGG pathways for potentially important genes

Results

Based on this review, at least 15 genes were reported to play a role in hot-cold classification in more than one TM system. Members of Cytochrome P450 *CYP* gene family were reported in all of the TM systems.

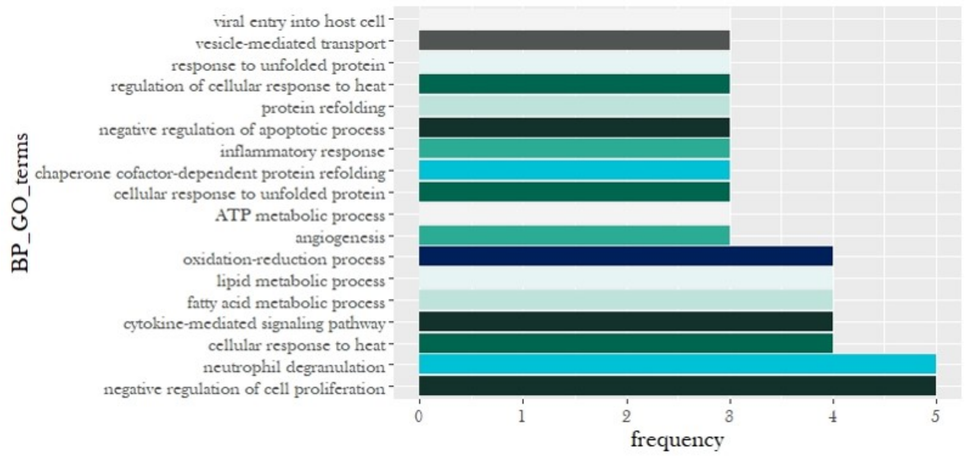


Figure 1. Bar plot created from most frequent biological processes (BPs) gene ontology (GO) terms for common genes in different TM systems

Common genes among investigated TMs

ADM, *ANPEP*, *CYP4F3*, *CYP2C19*, *CYP2D6*, *FCGR2A*, *HSPA1A*, *HSPA8*, *HSPA5*, *HSPA1B*, *IL8*, *KCNJ2*, *IL1R2*, *MYO5C* and *UBQLN4*

Some of the KEGG pathways for common genes:

- Metabolism of "Xenobiotics", "Drugs", and "Glutathione" by CYP
- "Protein processing in the endoplasmic reticulum"
- Pathways related to infection
- "Thyroid hormone synthesis"
- "Metabolic pathways"

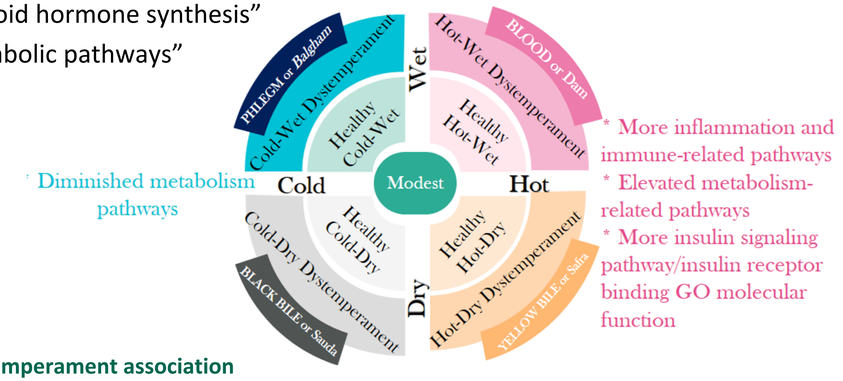


Figure 2. Temperament association

Discussions

The hot and cold concept represents the healthy balance state of the human body. It also explains how individuals might be susceptible to dystemperament which predisposes them to diseases. Treatment is chosen based on each individual's balance state to revive the person's equilibrium.

The results of this review shows the relationship between hot temperament (and dystemeparment) with inflammation, infections and higher metabolism in the body, which is in line with TM concepts. On the other hand, the cold temperament is demonstrated to be linked with lower metabolism, less thyroid hormone synthesis, and lower CYP gene levels which is in accordance with the TM definition of cold temperament (and dystemperament).

Strength, limitation and further research

- Limitation: Limited research is available for some TM systems, that lead us to report just a few common genes.
- Strength: different TM systems were assessed in this study and overlap between them were reported. This confirms the mutual base of the hot and cold theory in TMs from all over the world.
- More systems biology studies are recommended to understand the base of TM concepts.

Clinical Application

The TM classification of hot and cold which has been used for diagnosis, prevention and treatment for a long time seems to be in accordance with the results of Omics studies in precision medicine. This may open new horizons in accessible personalized medicine in future.

Conclusions

The holistic nature of systems biology approach may help in better understanding of biological bases of hot/cold concept.

Reference: Bahari F, Yavari M. Hot and Cold Theory: Evidence in Systems Biology. In Hot and Cold Theory: The Path Towards Personalized Medicine 2021 (pp. 135-160). Springer, Cham.

For references or further questions, please email: f_bahari@pasteur.ac.ir