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SYSTEMIST

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Editorial by Editor-in-Chief

The last year has been challenging for all societies. Most moved into a new era of ‘virtual’ conferences which was for many a new experience. It was an odd feeling to be speaking to a computer monitor and not to the delegation in person. But I am delighted to say it worked very well. The response from delegates exceeded our expectations and provided the basis for *new ventures*. The most notable being the introduction of short seminar/discussion sessions offered via Zoom to the community. To date two have already been given and we have three more lined up in the new year [details are on the UKSS web site]. Attendance to date has been very good, which we hope will continue in the new year.

Needless to say, there has been no real change in the state of the UK Systems Society since our last conference. As the board is ‘Virtual’ there have been few expenses and there are sufficient funds for a physical conference in 2022. *Membership* remains steady at 160 people. It is important to encourage those interested in Systems ideas to join the Society and help to develop it and help with its activities

The *management committee* has remained stable. We continue to have virtual meetings to discuss matters related to the many necessary tasks that keep the Society operating. To this end I would like to extend my thanks to our managers who have continued to operate in these difficult times. The committee has increased by one, Pavla Kramarova, who is has assumed the role of Postgraduate Liaison but will extend her responsibilities in the new year.

In the last newsletter you may have seen a summary of the review the team undertook of the society [we used AIM]. The outcome did not yield too many surprises, but the most important challenge is to recruitment of *a membership and a marketing secretary*. We need to recruit someone [or two] who is a Systems person, knows how to manage a membership database and how best to market the society. The task is vital, and to this end we plan to increase the management committee further. If YOU are interested in playing a part, then please contact me to discuss possibilities.

In terms of our *finances*, subscriptions and donations have remained in line with previous years. The COVID-19 pandemic over the past year means we have seen little financial activity other than expenditure of website development and the small number of hard copies of *Systemist* that we have to distribute to the British Library and subscribers. There are sufficient funds for a physical conference in 2022 [see below]

Systemist is published twice per year. All papers are double blind refereed, then those that are accepted are published are put onto the *Systemist* website, which is linked to the main UKSS site. The papers are published on an open access basis and the copyright remains with the authors. A soft and hard copy is lodged with the British Library. Hard copies are available to any author who wishes to purchase one, and soft copies are freely available from the *Systemist* website.

This edition comprises selected papers from the 2021 conference and provides a good guide to the range of topics in which our community is engaged

The 2022 International Conference will take place at Lancaster University. The management committee endorsed the suggestion to extend the conference at Lancaster from a single day

to two days [one night]. This will of course increase costs, e.g., dinner and cost of room and facilities for an extra day, but we will endeavor to keep the registration fees as low as possible. Accommodation and travel will be the delegate's own responsibility, but Lancaster has good student accommodation at a reasonable cost and there is a nice hotel adjacent to the university on the same site. We anticipate that the conference delegation will be made up primarily with face-to-face attendance, with a limited number of 'Zoom'-based presentations for the convenience of those who would be precluded from participating otherwise. We intend to keep these to a minimum as we feel it important that the community can meet in person after such a long time. We anticipate a return to 'normal' social interaction. Details of the conference will be posted before Christmas.

Frank Stowell
President UKSS

Editorial to Issue 42(1)

The five papers and four abstracts comprising this edition come from the proceedings of the UKSS International Conference 2021. Due to the impact of the COVID pandemic, and the restrictions introduced by the UK Government in consequence, this year's conference was virtual but still lively and interesting. Thanks are due to the Conference Chair, Gary Evans, for his enthusiasm and organization under these difficult circumstances, and to Dr Nigel Williams, Reader in Operations & Systems Management at the University of Portsmouth, who stepped in a short notice to give a very interesting Keynote presentation.

It is perhaps appropriate in these circumstances that human well-being forms a thread running through the various papers. The first paper (Sice, et al) presents an integrative well-being model drawing upon autopoietic theory of self-organisation in living systems. The focus in the work is upon the participants' awareness in their embodied experience of physical, emotional and relational wellbeing. This theme of an inextricable link between physical and emotional health is continued in the second paper (Krajewska). This author begins by grounding her discussion in the phenomenological idea of a lived-world suggested by Merleau-Ponty. She then goes on to consider the perspective on the interior lived-world that belongs to the traditions of Chinese wellbeing practices, focusing on restoring the natural balance of life-energy. A contrasting paper comes from Elvin, et al, who describe early progress in their research in the context of decision-making in a health service environment. They propose a new model to help engage participants and achieving more and sustained interactions, supporting consensus building for strategic planning. The next paper (Heslop, et al) shows similarities to those mentioned above in that it draws upon both autopoietic theory and creation of personal narratives by participants in order to explore its theme – in this case reframing social work assessment. The authors discuss introduction of a conceptual interactive practice tool that they have called Connecting Spaces. This tool is intended to facilitate assessments and therapeutic work with clients, both in person and online. The final paper (Kramarova and Stowell) is also concerned with interactions among people, in this case the participants in action research. The authors consider the restrictions faced by researchers in an era of pandemic, and what means may be found to empower interpersonal inquiry using communication technology platforms.

There are four short pieces included in this issue arising from work presented at the conference. The first of these (Cole, et al) explores how interactive virtual reality systems might be used to promote empathy and appreciation of complexity through embedded experience in contexts where conventional communications would fail. The second (Lohiya, et al) explore a different context of complexity – that of multichannel retail business – through a Systems lens. The last two contributions – by Rizvi, et al and by Cooray – explore both potential and challenges associated with machine learning from a systemic perspective.

Impact of Slow Rhythmic Movement on State of Coherence and Integrative Wellbeing

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Abstract

The focus of this paper is the study and evaluation of the effect of a short slow rhythmic movement practice on state of coherence and perceived wellbeing. The practice was made available via video during the Covid-19 pandemic.

An integrative wellbeing model grounded in autopoietic theory of self-organisation in living systems was used to inform the evaluation of impact and ensure the relevance of the data. More specifically, data quality was enhanced by focusing the participants' awareness on their immediate embodied experience of physical, emotional and relational wellbeing, sense of meaning, valence and activation.

The slow movement practice was found to have a positive impact on physical and emotional wellbeing, valence and sense of meaning. The changes that these entrainments produced were measurable and significant with a large size for physical and emotional wellbeing, sense of meaning, and a medium effect size for valence. This suggests there are potential health benefits to slow movement interventions and there is a need for further research into the impact of slow movement on health. Linking the rhythmic slow movement with resonating music is suggested for enhancing impact.

Key Words: consensus, human networks, multi-agent systems, trauma informed care.

Introduction

Movement therapies have been found to have positive effects on the mind and the body. In a 2016 study in South Africa students completing twice weekly cycling for 6 weeks showed improvements in depressive symptoms (Balchin et al, 2016). Dance positively impacts depression, both acutely (Koch et al, 2007) and long term (Pylvanainen et al, 2015) and also improves cardiovascular fitness (Fong Yan et al, 2018). Tai Chi has been shown to acutely increase heart rate variability (HRV) (Vaananen et al, 2002) and lengthen the pre-ejection period (PEP) of the heart (Motivala et al 2006). HRV is increased via vagal nerve activation (Berntson et al 1997), while PEP is lengthened by dampening down cardiac sympathetic nerve activation (Cacioppo et al. 1994). Yoga improves mood, reduces stress and anxiety (Streeter et al, 2010, Javnbakt et al 2009).

There is limited research into the development and evaluation of interventions on impact of slow movement on wellbeing. The focus of this research is the study and evaluation of the effect of slow rhythmic movement intervention on perceived wellbeing. A variation of a fifteen minutes slow movement qigong practice, initially developed by Dr Bisong Guo (2001), i.e., Energy Brushing Qigong. Qigong originated in China as a means of self-care, i.e., according to the first historical record in China “Shang Shu,” 4,000 years ago (Feng et al, 2020). The word Qigong consists of two Chinese characters: Qi and Gong. Qi is often translated to mean life energy, and Gong as work, and also merit (Cohen 1999). The word Qigong in this translation means working with life energy as well as the benefits one has as an outcome of Qigong practice (Cohen, 1999). Cohen (1999) suggests that a good Western definition of Qigong would refer to Qigong as a psychophysiological self-regulation (Cohen, 1999).

The underlying principle of the Energy Brushing Qigong exercise is to manipulate Qi (energy) and direct it to specific areas of the body using mostly slow arm movements and in a standing position, while maintaining sustained focus on the physical movements throughout. Energy Brushing Qigong provides easy to follow moves to empower and invigorate the entire body-mind system, improving circulation, increasing blood flow, enhancing breathing, clearing the mind, reducing stress. The practice was adapted by Dr Laurie Rauch (2020) with emphasis on the elements of the practice, associated with coherence of body and mind, and made available via video during the Covid-19 pandemic (Calming movement videos with Dr Laurie Rauch - Recovery College Online). Laurie Rauch has previously completed and studied a number of successful interventions in Exercise and Movement and Breathing with top sportsmen (e.g., Olympic athletes, professional soccer players, club rugby players, elite cyclists/runners MMA champion), stressed business /or executives and in Mental Disorders (e.g., Bipolar, PTSD) over a period of 25 years. His research focuses the effects of breathing and/or rhythmic movement on achieving a state of coherence and optimal functioning of the nervous system.

Coherence

The neurobiological process underpinning coherence occurs when a person’s heart and breathing rhythms are in coherence with their 10 sec blood pressure rhythm (Prinsloo et al 2011). If a person uses their breathing rhythm to guide their heart rhythm to cohere with their blood pressure rhythm, this beautiful coherent state is best attained in a quiet and contained

space. If it is too noisy or there are other distractions, the breathing rhythm becomes an ineffective guide for the heart rhythm.

This same beautifully coherent 10 sec rhythm in a person's heart during a stressful situation can be attained via rhythmic locomotor movement (Rauch et al 2013; Rauch, 2020). Coherence during a stressful situation occurs when the heart and blood pressure rhythms align, but not the breathing rhythm¹.

Of crucial importance for the establishment of the coherent 10 sec rhythm in the heart is that there must be no mental interference. This requires the person to stop thinking about anything else and keep a single-minded awareness on their breathing rate or locomotor movement depending on whether the breath or locomotor movement is being used to guide their heart rhythm to be in coherence with their 10 sec blood pressure rhythm. This will ensure that all mental activity aligns with the 10 sec rhythm in the heart. If everyone in a group of people is in a 10 sec coherent state then the social coherence amongst the group members will be optimal.

The essential characteristics of the rhythmic slow movement are outlined in Figure 1.

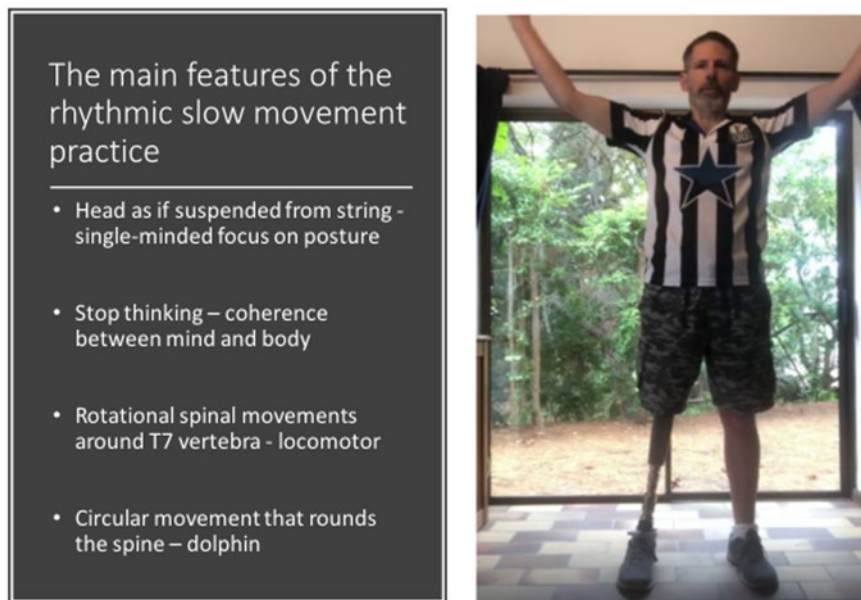


Figure 1. Essential Feature of the Slow Rhythmic Movement

Due to the pandemic the practice was offered strictly online, via a recorded video. There was no opportunity to collect reliable heart rate, respiration and blood pressure data. The impact of the practice on wellbeing was conducted through self-evaluation, based on an integrative model (Sice et al, 2020a, 2020b).

¹ Locomotor movement is co-ordinated by the basal ganglia located in the ventral frontal cerebrum. The coherent 10 sec rhythm in the heart occurs via activation of the vagal nerve, the parasympathetic arm of the baroreflex (van de Vooren et al., 2007), which is under modulatory control of the vmPFC (Resstel and Correa, 2006). Presumably the sympathetic vasomotor arm of the baroreflex is up regulated during locomotor movement.

Integrative Model of Wellbeing:

“Our personal knowing of the world is our way of experiencing it, of bringing forth a world. It is personal but not private as it arises in a continuous coupling with the environment.”

Francisco Varela

This section articulates the wellbeing model used in the self-evaluation (Figure 2) of the practice. It is grounded in the understanding of living systems and human cognition from the perspective of autopoiesis. The theory of autopoiesis defines and describes the dynamics of living as an autopoietic system, i.e., a network of processes of production of components that: (i) through their interaction and transformations continuously regenerate the network of processes that produced them; and, (ii) constitute the entity as a concrete by specifying the topological domain of its realisation as such a network (Maturana and Varela, 2012).

Autopoiesis is basic to the living individual. What happens to the individual is subservient to its autopoietic organisation, for as long as it exists the autopoietic organisation remains invariant. What this means, is that its identity, and therefore its emergent global processes, are generated through a process of self-organisation (Sice et al, 2004). Figure 2 attempts to give a ‘holistic view’ of what we discern as global processes in a human system. We have bodies comprised of cells working together, self-organising with in what we call ‘nervous system’, ‘immune system’, ‘cardio-vascular system’, etc., all dynamically integrated. We have mental activity experiences: thoughts, images, feelings, concepts, narratives, etc. and these are organised by a process of managing attention and intention, which Siegel (2010) refers to as ‘mind’. We are conscious beings and have the capability to be both aware of what we may perceive as external environment and also self-aware of how we are as a being as well as aware of our internal system dynamics (Damasio et al, 2016). We continuously make choices and act. These actions in turn impact our state of being and becoming. Porges (2009) suggests that humans and indeed mammals, first orient themselves and then act (Porges, 2009). This is interpreted in the model in Figure 2 as valence, i.e., positive or negative evaluation of the internal and/or external environment, that arises from the complex processes of body, mind, awareness in the context of the environment of the human system. In a sense the body, mind, awareness and valence/action systems contain information of the whole human system, and the whole system in turn impacts the processes that produce it. There is a local to global and global to local dynamics of the living system, that through self-organisation and self-production maintains living (Varela 1996, 1997; Sice et al, 2004). Thus, from an autopoietic perspective, the wellbeing could be defined as maintaining body, mind, and awareness coherence, i.e., homeostasis and adaptation within environment (Damasio et al, 2016; Sice et al., 2020). This definition is different from the hedonic (positive feeling) (Kahneman et al, 1999) and eudemonic (positive functioning) (Keyes et al., 2002), (Ryan et al., 2001) definitions of wellbeing. However, it encompasses their meaning, within a dynamic model of being acknowledging both positive feeling and orientation (valence), and homeostatic functioning (Figure 2).

Awareness of experiences as they unfold includes: witnessing present moment sensations, bodily states (alert, quiet, pleasant, unpleasant), mental activity (thoughts, feelings, memory,

intentions, beliefs, attitudes, etc.) and relational/environment experience (connectedness to others, nature, etc.), sense of meaning and purpose (Rauch et al, 2019; Levine 2010), and compassionate attitude to self (Maturana, 2008; Siegel, 2010; Neff, 2012; Gilbert, 2017), ensuring observation nurtures wellbeing as it is carried out with gentle kindness (Sice et al., 2020; Thompson and Varela, 2001, Varela et al., 2016). This has important implications for understanding and evaluation and measurement of human experience. As the living (autopoietic) system is embodied and situated, measuring and monitoring for wellbeing, requires an enquiry into the physical, mental and relational domains, interpreted from the perspective of the living system itself (Sice et al, 2019).

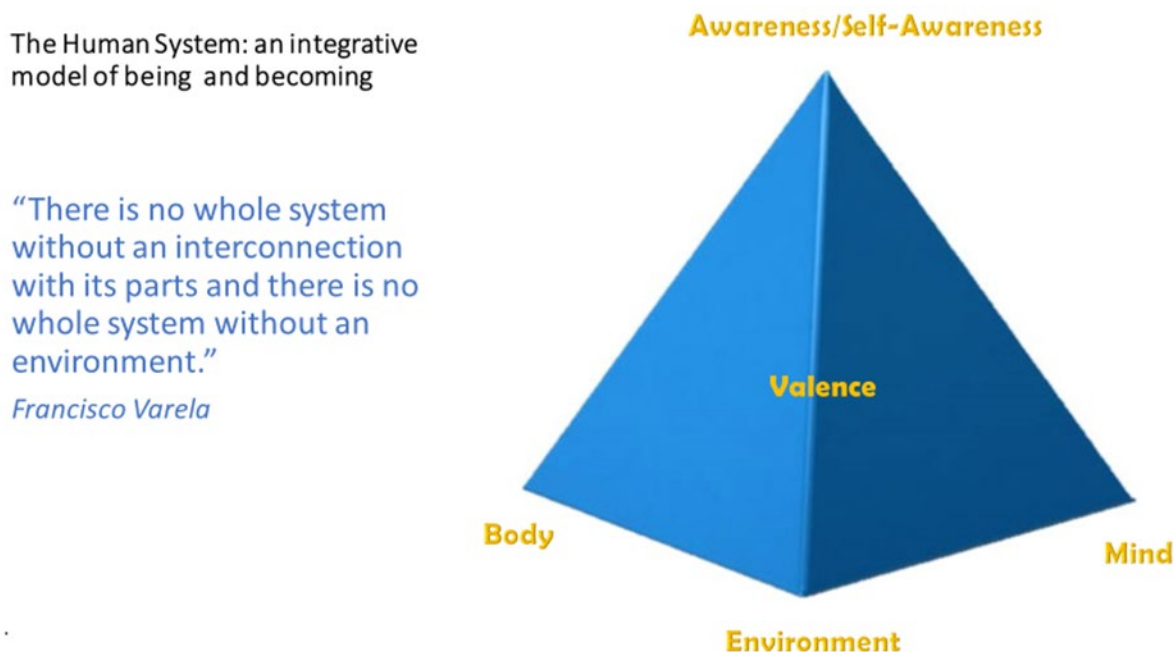


Figure 2. Wellbeing Pyramid: Integrative Model of (Well)

The model of being and its use are described in detail in assessing the impact of Music listening on perceived wellbeing, valence and activation (Sice et al 2020) and the impact of Lung benefitting qigong on wellbeing (Sice et al, 2020). In July 2020, the model was adopted by the Tees, Esk and Wear Valleys NHS Foundation Trust to inform the design of a staff wellbeing screening tool.

In the context of this study, the model implementation requires creating the conditions for encouraging introspection, i.e. accessing individual awareness and interpretation of personal experience in the present moment in the physical, emotional and relational domains (Price et al, 2018). The perceived benefits of this approach are collecting data with immediate reference to the embodied experience, interpreted by the participants themselves.

Data was collected from online ‘wellbeing diaries’. Subjects were in some sense their own controls, an aspect of the study made possible by measurement “before and after” the intervention. The autopoietic perspective adopted in this study (Sice et al, 2020), suggests that our experience of the world is born in our interactions with the environment and is validated

by our embodiment. It was thus of utmost importance that the method of enquiry created conditions for paying attention and accessing immediate personal experience through a disciplined act of cultivating capacity ‘of becoming aware’ of the sources of this experience (Depraz et al., Varela et al. 2016; Sice et al, 2018). Stowell (2020) asserts that everything that “exists” is the result of personal experience, thus, a subjective (phenomenological) account shapes the experiencer’s capacity to observe and learn.

Thus, a diary method was considered appropriate for this study (Bartlett, 2015, McDuff et al; Pavel et al). It was designed to collect both quantitative and qualitative data. The quantitative data consisted of participants rating their own interpretation of their experience of wellbeing, before and after the exercise. The diary required the participant to reflect on their present experience, rating their perception of wellbeing according to the four dimensions of the wellbeing model in Figure 2 and according to valence (pleasant/unpleasant experience) on a scale from -5 (poor) to 5 (excellent) and to leave short comments if they choose to do so. Participants were also encouraged to consider their state of being in the moment to promote greater clarity of their inner emotional landscape. They were then asked to rate the intensity of the positive/negative emotions they might be experiencing (Appendix A). The ratings are associated with emotions felt by the individuals.

The mapping of emotions takes into account valence (Watson, 1985). The mapping of emotions in the pleasant (positive) / unpleasant(negative) categories is coherent with David Hawkins scale of experience and literature on categorisation of basic emotions (Zara et al., 2007; Levenson, 2011; Hawkins, 2013). Positive emotions included: -low arousal level emotions: peace, love, safety; - high arousal level emotions: joy, motivation and enthusiasm. Negative emotions included: - low arousal level emotions: apathy, guilt, sadness; -high arousal level emotions: -anxiety, fear and anger (Schriewer, 2016).

Statistical Analysis

There were 60 participants in total, out of which 38 completed both the pre and post diaries. After cleaning the data to account for a minimum duration of 10 min, entries for 24 participants were considered. The mean scores for the four wellbeing dimensions and the valence before and after the exercise are shown in Table 1. They reflect an increase for all the values post-intervention ranging from 0.04 for relational wellbeing to 1.58 for physical wellbeing. These values are also shown in the radar chart in Figure 3.

Kolmogorov-Smirnov and Shapiro-Wilk tests are employed to test the data for normality. The results are shown in Table 2. Both tests show that none of the variables is normally distributed ($P<0.05$). Therefore, the non-parametric one-tailed Wilcoxon signed rank test is applied to detect any statistically significant increases. The threshold for statistical significance is set to $P=0.05$. The effect size r is also computed. A small effect is associated with an r threshold of 0.10, a medium effect for $r=0.30$, and a large effect for $r=0.50$. The results are shown in Table 3.

The Wilcoxon signed rank test reveals statistically significant differences for physical wellbeing with a large effect size ($P<0.001$, $r= 0.545$), emotional wellbeing with a large effect size ($P<0.001$, $r= 0.528$), sense of meaning with a large effect size ($P<0.001$, $r= 0.504$), and

valence with a medium effect size ($P=0.003$, $r=0.393$). The differences in relational wellbeing (connectedness) are not significant ($P=0.354$, $r=0.054$).

Table 1 Mean scores before and after the intervention.

	Before	After	Change
Physical	1.50	3.08	1.58
Emotional	1.71	3.21	1.50
Relationships	1.88	1.92	0.04
Sense of Meaning	1.63	2.46	0.83
Valence	2.00	3.13	1.13

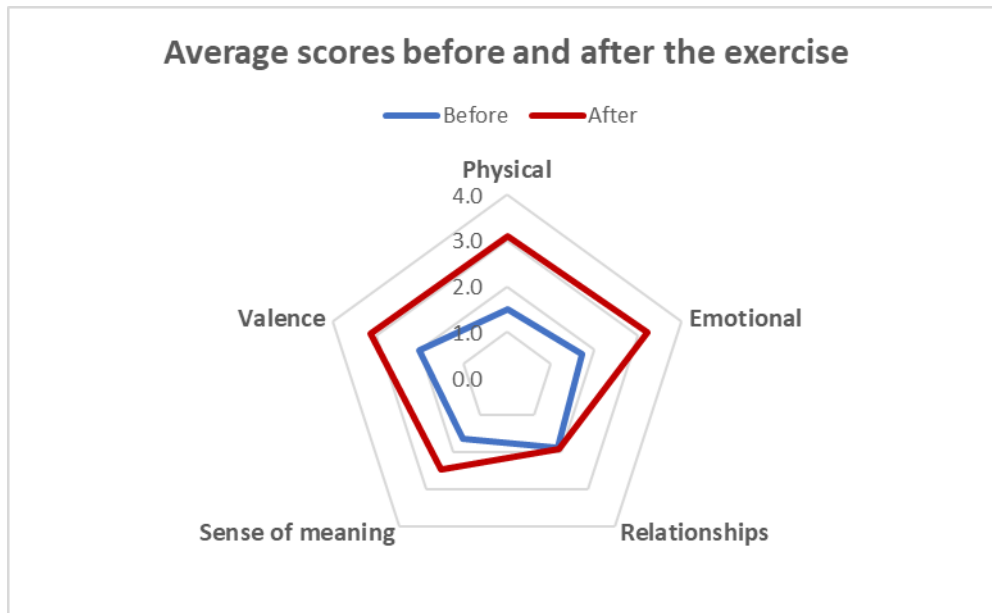


Figure 3. Mean scores before and after the exercise.

Table 2 Normality tests: test statistic and p-values. P-values less than 0.05 are in bold.

Music group	Kolmogorov-Smirnov		Shapiro-Wilk	
	Test statistic	<i>P</i>	Test statistic	<i>P</i>
Physical	0.222	0.003	0.852	0.002
Emotional	0.183	0.037	0.889	0.012
Relationships	0.199	0.015	0.907	0.030
Meaning	0.309	<0.001	0.734	<0.001
Valence	0.243	0.001	0.91	0.035

Table 3 One-tailed Wilcoxon signed-rank test results: z-score (test statistic), p-values, and effect size r . P-values less than 0.05 are in bold

	Test statistic	P	r
Physical	3.774	<0.001	0.545
Emotional	3.659	<0.001	0.528
Relationships	0.373	0.354	0.054
Sense of meaning	3.490	<0.001	0.504
Valence	2.721	0.003	0.393

Correlation between wellbeing variables:

Pearson correlation coefficients between different wellbeing dimensions and valence are shown in Table 4. Valence is highly correlated to all wellbeing dimensions, particularly physical wellbeing ($\rho=0.809$) and emotional wellbeing ($\rho = 0.807$). Inter-correlations among the four wellbeing variables are also high, the highest being between physical and emotional wellbeing ($\rho = 0.899$), and the lowest between relational wellbeing and sense of meaning ($\rho = 0.568$).

Table 4 Pearson correlation coefficients between valence and various wellbeing dimensions.

	Physical	Emotional	Relationships	Meaning	Valence
Physical	1.000	0.899	0.612	0.737	0.809
Emotional	0.899	1.000	0.620	0.802	0.807
Relationships	0.612	0.620	1.000	0.568	0.600
Meaning	0.737	0.802	0.568	1.000	0.715
Valence	0.809	0.807	0.600	0.715	1.000

Negative emotions – including sadness, guilt, apathy, anger, fear and anxiety – and positive emotions – including peace, love, safety, joy, motivation, and enthusiasm – were rated by users on a scale from 0 (low) to 10 (high). We compute the correlations between the six negative emotions and the six positive emotions separately using Pearson correlation coefficients. The results are shown in Tables 5 and 6, respectively.

There were only 3 entries with a negative valence rating, i.e. negative emotions. Therefore, correlation coefficients shown in Table 5 are not reliable. It was also not possible to compute correlations with ‘anger’ as it has a variance of 0. For the positive emotions, the highest correlations are found between joy and love ($\rho = 0.892$), and motivation and enthusiasm ($\rho = 0.827$); and the lowest correlations are between safety and motivation ($\rho = 0.293$), and safety and enthusiasm ($\rho = 0.329$).

Table 5 Pearson correlation coefficients for negative emotions.

	Sadness	Guilt	Apathy	Anger	Fear	Anxiety
Sadness	1.000	-0.189	-0.500	-	1.000	0.803
Guilt	-0.189	1.000	0.945	-	-0.189	-0.737
Apathy	-0.500	0.945	1.000	-	-0.500	-0.918
Anger	1.000	-0.189	-0.500	-	1.000	0.803
Fear	0.803	-0.737	-0.918	-	0.803	1.000
Anxiety	1.000	-0.189	-0.500	-	1.000	0.803

Table 6 Pearson correlation coefficients for positive emotions.

	Peace	Love	Safety	Joy	Motivation	Enthusiasm
Peace	1.000	0.725	0.593	0.690	0.607	0.705
Love	0.725	1.000	0.700	0.892	0.662	0.657
Safety	0.593	0.700	1.000	0.626	0.293	0.329
Joy	0.690	0.892	0.626	1.000	0.681	0.607
Motivation	0.607	0.662	0.293	0.681	1.000	0.827
Enthusiasm	0.705	0.657	0.329	0.607	0.827	1.000

The arousal/quietness level is also computed on a scale from -5 (quiet) to 5 (aroused) based on the most prevalent emotions for each user as follows.

1. Sadness, apathy, guilt, peace, love, and safety ratings are changed to negative values by taking their opposites. These emotions are associated with a quiet/calm state.
2. The scores for the displayed emotions for each person are then added. Each person rates 6 emotions (either positive or negative) on a scale from 0 to 10, out of which 3 are now on a scale from -10 to 0. Adding these will result in a range of values between -30 and 30.
3. These values are then re-coded between -5 and 5 indicating different levels of arousal as follows: [-30, -23] => -5; [-22, -18] => -4; [-17, -13] => -3; [-12, -8] => -2; [-7, -3] => -1; [-2, 2] => 0; [3, 7] => 1; [8, 12] => 2; [13, 17] => 3; [18, 22] => 4; [23, 30] => 5.

Using the participant's own valence rating with their computed arousal level, the scatter plot in Figure 4 is obtained. Apart from all valence ratings becoming positive after the intervention, no special pattern is observed for the arousal level.

We also apply the two-tailed Wilcoxon signed rank to the arousal variable to detect any differences before and after the exercise. The results are shown in Table 7. The mean arousal level has stayed the same post-intervention (-0.208), and no statistical significance in the differences is observed ($P=0.942$, $r=-0.011$).

Table 7 Mean values and two-tailed Wilcoxon signed rank test results to compare the arousal level before and after the intervention.

Mean before	Mean after	<i>p</i>	<i>r</i>
-0.208	-0.208	0.942	-0.011

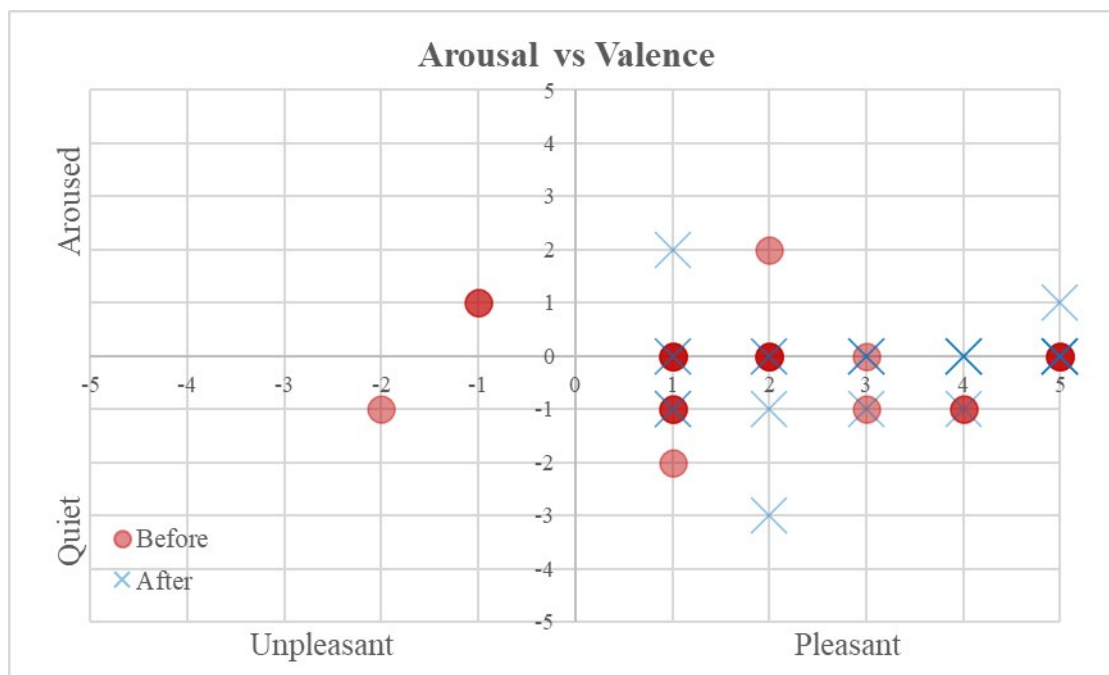


Figure 4. Activation level vs valence before and after the intervention.

Conclusion

The slow movement exercise was found to have a positive impact on physical and emotional wellbeing, valence and sense of meaning. The changes that these entrainments produced were measurable and significant with a large size for physical and emotional wellbeing, sense of meaning, and a medium effect size for valence. This suggests there are potential health benefits to slow movement interventions and there is a need for further research into the impact of slow movement on health.

Research is in progress in integrating perceptual correlates of wellbeing with biomarkers (such as blood pressure, heart rate variability, brain activity, etc., and creating music and art spaces for exploring biofeedback (Figure 5, [Calming movement videos with Dr Laurie Rauch - Recovery College Online](#)).

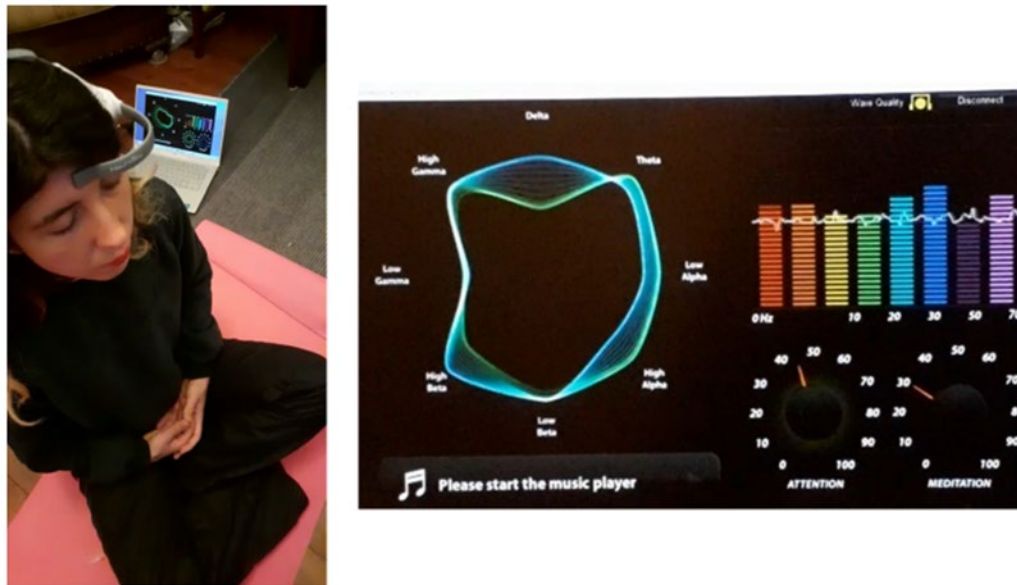


Figure 5. Spaces for Exploring Biofeedback

The wellbeing model and diary approach used in the evaluation allowed for monitoring change, i.e. before and after exercise. The quality of the data was enhanced by: focusing the participants awareness on their immediate embodied experience of physical, emotional and relational wellbeing and sense of pleasure/displeasure, while requesting that they rate and interpret the experience themselves.

Limitations

This was a study conducted during the time of the Covid-19 pandemic which presents several limitations that need to be addressed in future work. One limitation is the demographic information about the participants. Future investigation should include participants who are more thoroughly representative of different age groups and other demographic factors. Another limitation is the limited qualitative data. Future research would benefit from encouraging participants to share their experience in free text, to allow for cross-reference between quantitative measures and individual perception of wellbeing and emotion.

References

- Balchin R, J Linde, D Blackhurst, HGL Rauch, G Schoenbacler. (2016). Sweating away depression? The impact of intensive exercise on depression. *Journal of Affective Disorders* 200: 218 – 221. DOI: <https://doi.org/10.1016/j.jad.2016.04.030>.
- Bartlett, R. and Milligan, C., (2015). *What is diary method?* Bloomsbury Publishing.
- Berntson, G. G., Bigger, J. T., Eckberg, D. L., Grossman, P., Kaufmann, P. G., Malik, M., Nagaraja, H. N., Porges, S. W., Saul, J. P., Stone, P. H. & VanderMolen, M. W. (1997). Heart

rate variability: Origins, methods, and interpretive caveats. *Psychophysiology*, 34(6), 623-648. DOI: <https://doi.org/10.1111/j.1469-8986.1997.tb02140.x>.

Cacioppo, J. T., Berntson, G. G., Binkley, P. F., Quigley, K. S., Uchino, B. N. & Fieldstone, A. (1994). Autonomic Cardiac Control .II. Noninvasive Indexes and Basal Response As Revealed by Autonomic Blockades. *Psychophysiology*, 31, 586-598. DOI: <https://doi.org/10.1111/j.1469-8986.1994.tb02351.x>.

Cohen, K. (1999). *The way of qigong: The art and science of Chinese energy healing*. Wellspring/Ballantine.

Damasio, A., & Damasio, H. (2016). Exploring the concept of homeostasis and considering its implications for economics. *Journal of Economic Behavior & Organization*, 126, 125-129. DOI: <https://doi.org/10.1016/j.jebo.2015.12.003>.

Depraz, N. E., Varela, F. J., & Vermersch, P. E. (2003). *On becoming aware: A pragmatics of experiencing*. John Benjamins Publishing Company.

Fong Yan Cobley S, Chan C et al. (2018), The Effectiveness of Dance Interventions on Physical Health Outcomes Compared to Other Forms of Physical Activity. *Sports Med* 48(4), 933–951. DOI: <https://doi.org/10.1007/s40279-017-0853-5>.

Gilbert, P. (Ed.). (2017). *Compassion: Concepts, research and applications*. Taylor & Francis.

Guo, Bisong, and Andrew Powell (2001). *Listen to your body: The wisdom of the Dao*. University of Hawaii Press, 2001.

Hawkins, D.R., (2013). *Power vs. force: The hidden determinants of human behavior*. Hay House, Inc.

Javnbakht M, Hejazi Kenari R and Ghasemi M. (2009). Effects of yoga on depression and anxiety of women. *Complementary Therapies in Clinical Practice* 15(2), 102–104. DOI: <https://doi.org/10.1016/j.ctcp.2009.01.003>.

Kahneman, D., Diener, E., & Schwarz, N. (Eds.), (1999). *Well-being: Foundations of hedonic psychology*. Russell Sage Foundation.

Keyes, C. L., Shmotkin, D., & Ryff, C. D. (2002). Optimizing well-being: the empirical encounter of two traditions. *Journal of personality and social psychology*, 82(6), 1007–1022. DOI: <https://doi.org/10.1037/0022-3514.82.6.1007>.

Koya, Kushwanth, Petia Sice, and Laurie Rauch. (2016). An enactive perspective on comprehending leadership: A comparative case study approach. *Human Systems Management* 35(3), 197-212. DOI: 10.3233/HSM-160869.

Levenson, R.W., (2011). Basic emotion questions. *Emotion review*, 3(4), pp.379-386.

Levine, P. A., (2010). *In an unspoken voice: How the body releases trauma and restores goodness*. North Atlantic Books.

Maturana, H. R., & Varela, F. J. (2012). *Autopoiesis and cognition: The realization of the living* (Vol. 42). Springer Science & Business Media.

Maturana, H. R., & Verden-Zöllner, G. (2008). *The origin of humanness in the biology of love*. Imprint Academic.

McDuff, D., A. Karlson, A. Kapoor, A. Roseway and M. Czerwinski, (2012). AffectAura: Emotional wellbeing reflection system," 2012 6th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth) and Workshops, San Diego, CA, 2012, pp. 199-200.

Motivala, S. J., Sollers, J., Thayer, J. & Irwin, M. R. (2006). Tai Chi Chi acutely decreases sympathetic nervous system activity in older adults. *Journals of Gerontology Series A-Biological Sciences and Medical Sciences*, 61, 1177-1180.

Neff, K. D. (2012). The science of self-compassion. *Compassion and wisdom in psychotherapy*, 1, 79-92.

Ogwu, S., Sice, P., Keogh, S., Goodlet, C.(2020). "An exploratory study of the application of mindsight in email communication." *Heliyon* 6(7), e04305. DOI: <https://doi.org/10.1016/j.heliyon.2020.e04305>.

Pavel, D., V. Callaghan and A. K. Dey, (2011). From self-monitoring to self-understanding: Going beyond physiological sensing for supporting wellbeing, *2011 5th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth) and Workshops*, Dublin, 2011, pp. 312-315, doi: 10.4108/icst.pervasivehealth.2011.245999.

Porges S.W., (2009). The polyvagal theory: new insights into adaptive reactions of the autonomic nervous system. *Cleveland Clinic journal of medicine*. 2009 Apr; 76(Suppl 2): S86. DOI: 10.3949/ccjm.76.s2.17.

Prinsloo, G. E., Derman, W. E., Lambert, M. I., and Rauch, H.G.L. (2013). The effect of a single session of short duration biofeedback-induced deep breathing on measures of heart rate variability during laboratory-induced cognitive stress: a pilot study. *Appl. Psychophysiol. Biofeedback*. 38(2), 81–90. DOI: <https://doi.org/10.1007/s10484-013-9210-0>

Pylvanainen Muotka JS, Lappalainen R. (2015). A dance movement therapy group for depressed adult patients in a psychiatric outpatient clinic; effects of the treatment *Front. Psychol.* 6:980. DOI: <https://doi.org/10.3389/fpsyg.2015.00980>.

Rauch HGL, S. Smit, D. Karpul, TD Noakes (2013). Effect of Taijiquan training on autonomic re-activity and body position and postures during mock boxing: a feasibility study. *Book of Abstracts, 18th Congress of European College of Sport Science* Barcelona, Spain, 25-28 June 2013.

Rauch, H.L., Sice, P., Bentley, E. and Uhomoihi, J., (2019). Autopoietic Management of Behaviour, Reflection, Awareness and Innovation in a circular economy. *Systemist*, 40(1), 117-132.

Rauch, H. L. (2020). *KEEPING CALM: How to Master your Brain Reward System to Optimise your Health, Wellbeing and Performance*, Cape Town, Kindle Edition.

Resstel, L.B.M., and Correa, F.M.A. (2006). Medial prefrontal cortex NMDA receptors and nitric oxide modulate the parasympathetic component of the baroreflex. *Eur. J. Neurosc.* 23, 481-488. DOI: doi.org/10.1111/j.1460-9568.2005.04566.x.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual review of psychology*, 52(1), 141-166. DOI: <https://doi.org/10.1146/annurev.psych.52.1.141>.

Schriewer, K. & Bulaj, G., (2016). Music streaming services as adjunct therapies for depression, anxiety, and bipolar symptoms: convergence of digital technologies, mobile apps, emotions, and global mental health. *Frontiers in public health*, 4, p.217. <https://doi.org/10.3389/fpubh.2016.00217>.

Sice, P., & French, I. (2004). Understanding humans and organisations: Philosophical implications of autopoiesis. *Philosophy of Management*, 4(1), 55-66. DOI: <https://doi.org/10.5840/pom20044114>.

Sice, P., Kushwanth K., & Mansi, S., (2013). Leadership capability: An autopoietic perspective. *Human Systems Management* 32(2), 95-103. DOI: 10.3233/HSM-130790.

Sice, P., Bentley, E. and Rauch, L., (2018). Ontology, epistemology and the complexity of human neurobiology. *Human Systems Management*, 37(3), 353-360. DOI: 10.3233/HSM-171795.

Sice, P., Elvin, G., Riachy, C., Shang, Y., Ogwu, S., & Zink, C. (2020), Online Screening of X-System Music Playlists Using an Integrative Wellbeing Model Informed by the Theory of Autopoiesis. *IEEE Access*, 8, 182307-182319.

Siegel, D. J. (2010), *Mindsight: The new science of personal transformation*. Bantam.

Stowell, F. (2020). Part two: the challenges of a soft systems inquiry. Integrating Husserl and Gadamer. *Kybernetes*, 50(5), 1553-1565. DOI: <https://doi.org/10.1108/K-05-2020-0281>.

Streeter, C.C., Whitfield, T.H., Owen, L., Rein, T., Karri, S.K., Yakhkind, A., Perlmutter, R., Prescott, A., Renshaw, P.F., Ciraulo, D.A. and Jensen, J.E., (2010). Effects of yoga versus walking on mood, anxiety, and brain GABA levels: a randomized controlled MRS study. *The Journal of Alternative and Complementary Medicine*, 16(11), 1145-1152. DOI: <https://doi.org/10.1089/acm.2010.0007>.

Vaananen, J., Sun, X. S., Wang, S. X., Laitinen, T., Pekkarinen, H. & Lansimies, E. (2002), Taichiquan acutely increases heart rate variability *Clinical Physiology and Functional Imaging*, 22(1), 2-3. DOI: <https://doi.org/10.1046/j.1475-097X.2002.00355.x>.

Varela, F. J. (1996). Neurophenomenology: A methodological remedy for the hard problem. *Journal of consciousness studies*, 3(4), 330-349.

Varela, F. J. (1997). Patterns of life: Intertwining identity and cognition. *Brain and cognition*, 34(1), 72-87.

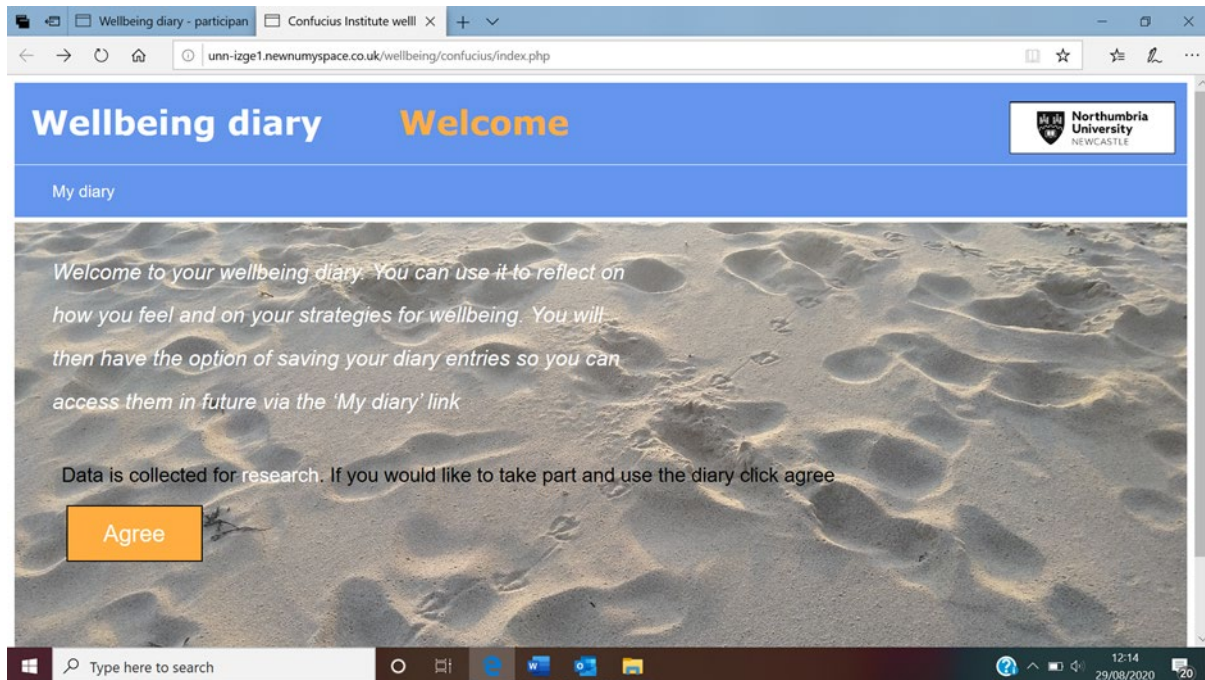
Varela, F. J., Thompson, E., & Rosch, E. (2016). *The embodied mind: Cognitive science and human experience*. MIT press.

van de Vooren, H., Gademan, M. G., Swenne, C. A., TenVoorde, B. J., Schalijs, M. J., and Van der Wall, E. E. (2007), Baroreflex sensitivity, blood pressure buffering, and resonance: what are the links? Computer simulation of healthy subjects and heart failure patients. *J. Appl. Physiol.* 102(4), 1348–1356. DOI: <https://doi.org/10.1152/jappphysiol.00158.2006>.

Watson, D. and Tellegen, A., (1985). Toward a consensual structure of mood. *Psychological bulletin*, 98(2), 219–235. DOI: <https://doi.org/10.1037/0033-2909.98.2.219>.

Zara, A., Maffiolo, V., Martin, J.C. and Devillers, L., (2007). September. Collection and annotation of a corpus of human-human multimodal interactions: Emotion and others anthropomorphic characteristics. In *International Conference on Affective Computing and Intelligent Interaction* (pp. 464-475). Springer, Berlin, Heidelberg.

Appendix A



Sice, at al

Wellbeing diary **Sense of wellbeing post**

Sign up

Please now **again** reflect on, and rate your perception of how you are feeling in the moment using all of the sliders below:

To remind you of how you completed the form last time, the sliders has been set to the last position you choose. You can change them

Physical Wellbeing

Poor Excellent (0)

Please describe any comfort / discomfort you are aware of

Type here to search

Wellbeing diary - participan Confucius Institute welll

unn-izge1.newnumyspace.co.uk/wellbeing/confucius/senseOfWellbeingForm.php

Emotional Wellbeing

Poor Excellent

Please describe any emotions and thoughts you are aware of

Sense of connectedness with others, i.e. family, friends, community, etc.

Lonely, unappreciated Connected, appreciated

Please leave a comment if you would like to

Type here to search

The Subtle-Energy-Body as a Self-Organising System: An Enquiry into the Lived-Experience of TCM Qigong Practitioners

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According to enactive cognitive science (Varela, Thompson), we are not just born into a given, pre-existing world. We discover, make sense of, and shape the world of which we are part, or, as Merleau-Ponty has it, we incorporate and synthesise the world of our lived-body. As self-organising, autonomous beings, we create and are formed by our environment, and are drawn towards equilibrium and wellbeing through our seamless experience of living in the world. The literature of phenomenology has explored this outward-oriented dimension of experience extensively. However, less explored is the interior lived-world that belongs to the traditions of Chinese wellbeing practices such as Health Qigong (Jiànshēn Qìgōng 健身气功) and Traditional Chinese Medicine Qigong (TCM Qigong) (Zhōngyī Qìgōng 中医气功) whose aim is to restore the natural balance of life-energy.

Over recent years, these forms of exercise have been the subject of clinical research, with good clinical evidence for improved health and wellbeing. Such studies are immensely valuable in closing the cultural gap between the different world views of western medicine and TCM, and support the promotion of these practices for health maintenance and restoration. However, the clinical research methodology of these studies tends to be reductive insofar as it generally does not look beyond biological or psychological mechanisms of action to account for health improvements, passing over the principles of TCM that provide their own account of wellbeing.

This paper draws on phenomenology – in particular, the work of Merleau-Ponty relating to perception, and Drew Leder’s work on the body – to examine the diary entries of a selection of volunteers who, during Covid-19 lockdown in Spring 2021, took part in a research project into wellbeing by Northumbria University Informatics Wellbeing Team, and learned a new TCM Qigong exercise routine.

We argue that, by turning their sense perceptions inwards towards new dimensions of the subtle body created by TCM Qigong practice, participants discover the positively thematised body as a self-organising space for the restoration of health. This model of lived-body wellbeing contrasts with the objectified body of medical science. Moreover, it also contrasts with some of phenomenology’s more limited depictions of the lived-body as thematised only in illness and absent from experience when human endeavours are flowing freely.

Key words:

TCM Qigong, Traditional Chinese Medicine, Wellbeing, Phenomenology, Lived-body, Self-care, Health maintenance.

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Introduction: background to the research project



Image: *Nèijīng tú* 内经图 : Daoist inner landscape

“The human body is the image of a country” implies a relation that transcends the simple metaphor. The emphasis on *country* reflects the interdependence of the human being and his environment, as well as Taoism’s fundamental teaching that favors the interior over the exterior.

Kristofer Schipper *The Taoist Body*

During eight weeks in spring 2021, in partnership with Northumbria University Wellbeing Informatics Team, the Confucius Institute at the University of Wales Trinity Saint David carried out a research project into the efficacy of Traditional Chinese Medicine (TCM) Qigong (*zhōngyī qìgōng* 中医气功). As well as assessing the immediate benefits on wellbeing, the research also sought to understand the experiences of the participants and how they relate to TCM’s model of wellbeing.

The project timing coincided with the period of Covid-19 restrictions in the UK, providing an opportunity to recruit participants who were looking for ways of improving their mental and physical wellbeing. The research project emerged following the initial promising results of a previous, smaller study into this form of Qigong exercise (Sice, 2020). The project had the advantage of adapting the initial data-gathering tools from the 2020 study in order to capture qualitative data on distinctive features of TCM Qigong. The analysis of the quantitative data gathered is the subject of a separate paper yet to be published (Sice, 2021). However, key to the focus of this paper is the qualitative data gathered in participants’ practice diaries.

Demographic profile of the participants

An initial 170 participants from the UK and Europe volunteered to take part in the study. The predominant demographic of the participants was white, female, aged between 45 and 74. The largest number of participants had little or no previous experience of Qigong or Taiji. Although the participant group also included some Taiji and Qigong regular practitioners, none had specific knowledge of TCM Qigong. The focus for the discussion that follows comes from the diary entries of participants who had some previous experience of Taiji or Qigong. Additional

criteria for selection were that they must have completed the exercise at least twice a week and provided detailed information about their experiences in their practice diaries.

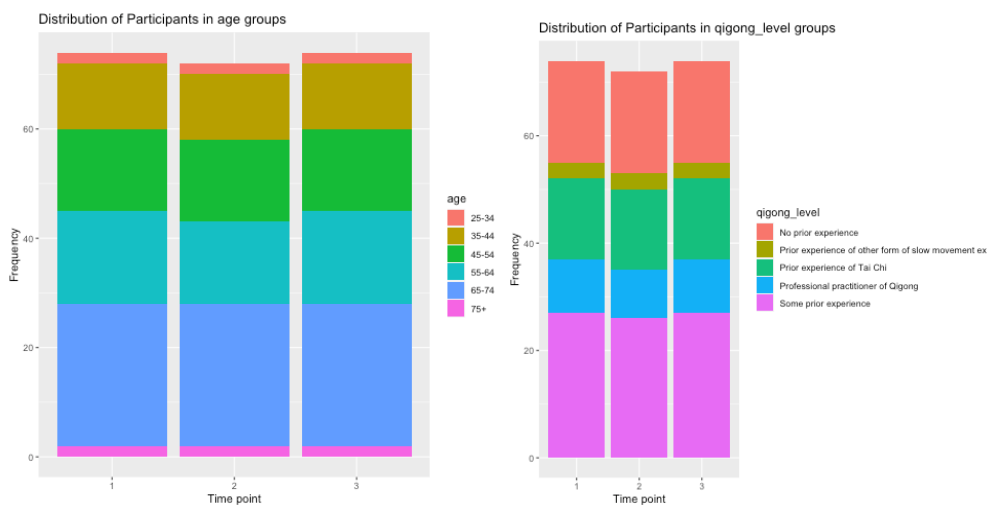


Figure 1 Demographic distribution of participants (Zeyneb Kurt 2021)

TCM Qigong Exercise

Participants initially learnt the TCM Qigong routine through a mixture of video recordings and weekly live, remotely-delivered sessions with the TCM Qigong tutor. Additionally, the learning experience developed further as participants' questions about the theory and practice were fed into each week's live practice, enabling strong student/tutor interaction and promoting increasingly rich understanding of the practice. Volunteers completed an online practice diary after each session and commented on their experiences under five headings: body awareness; focussed attention; *qi* awareness; relational awareness, and sense of meaning and satisfaction.

The specific practice selected for the study was the Lung-Strengthening Qigong Exercise (*jiàn fèi fùyuán dǎo yǐn fǎ* 健肺复原导引法) designed by the research project partner, Jiangxi University of Chinese Medicine (JUCM). This form was chosen for the targeted effect of the practice on the organs most at risk from potential Covid-19 infection while also working on whole person wellbeing. A short overview of Qigong practices in general may be helpful to distinguish TCM Qigong from other forms of Qigong exercise.

Qigong exercise belongs to a family of self-care (*yǎngshēng* 养生) practices that originated from Daoism, Buddhism and Confucianism, and have continued to be practised over millennia as efficacious health maintenance routines. They embrace many of the features of Traditional Chinese Medicine such as principles of *yin* and *yang*, the five elements, and of course, *qi* energy. The term Qigong (literally, *qi*-work) is a modern coinage that emerged in the mid-20th Century and was used to refer to breath-based health practices that at the time were gradually gaining official status in China through government regulation (Hsu, 1999). While there are many forms of Qigong exercise, only relatively few have become known in the West over the past couple of decades. These belong to what is known in China as Health Qigong (*jiànshēn qìgōng* 健身气功) and include forms such as the Eight Section Brocade (*bā duàn jǐn* 八段锦) and

Five Animals Qigong (wǔ qínxì 五禽戏), and have commonly featured in Western published clinical research. TCM Qigong (*zhōngyī qìgōng* 中医气功) is a relative newcomer to the Qigong scene in recent years. Aligned even more closely with Traditional Chinese Medicine principles than Health Qigong, TCM Qigong has several distinguishing features that also show the influence of Western medicine, for instance, the emphasis on physiology. However, the practice retains the core values of its Chinese heritage.

It is worth quoting the definition of TCM Qigong provided by Professor Zhang Wenchun:

TCM Qigong is based on a holistic outlook on life. Through the active exercise of introspective consciousness, it transforms, perfects, and improves the life functions of the human body, turning natural instincts into conscious and intelligent practices.

(Zhang, 2020)

Central to the practice is the transformation of *qi* energy by the practitioner, as external *qi* is gathered into the body through consciously directed movement. According to Pang Ming, the founding father of *Zhīnéng Qìgōng* (智能气功), (incidentally, also providing the direct lineage to TCM Qigong), the energy exchange between the *qi* of human beings and that of environment is a metabolic process where *qi* is the interface for matter, energy, and information (Pang, 1992, 2014).

The Lung-Strengthening Qigong Exercise is characterised by slow movement and a meditative state of mind and combines dynamic elements with its largely static method of practice. Core to the practice is the focus on entering ‘*Qi State*’ (*qì gōng zhuàng tài* 气功状态), akin to ‘being in the zone’. This is achieved through the harmonisation of the three elements that constitute the human being, namely: body (*xíng* 形), mind (*shén* 神), and *qi* (气) energy.

The whole routine consists of four sections bookended by an opening and closing sequence, and is performed using slow hand and arm movements. The exercise places equal importance on the physical and mental aspects (although there are more advanced variations of the practice with differing emphases), (Pang, 1992). The principle is that of: ‘where the mind goes, *qi* follows.’ The focus is on the mind following the physical movement and becoming absorbed in the enaction of that movement. The physical movement in turn embodies *qi* energy whose dual phases of opening to release internal *qi* and closing to gather external *qi* enable energy exchange. The exercise is normally performed in a standing position. Participants have their eyes shut and follow the instructor’s guided visualisation. As the location of energy centres in the body, as well as internal physical organs is not so familiar to many, throughout the eight weeks of practice participants were also taught the position of the three *dāntián* (丹田) energy-centres, other key acupoints, and were shown diagrams and models of the lungs and kidneys.

Recent research into Qigong Exercise

There has been much research into the clinical effectiveness of Qigong over the past decade. Byeonsang Oh's meta-analysis of 2020 identified and screened 996 published studies that investigated the effect of Taiji and Qigong practice on the immune system. Klein's study (2017) cites 107 studies which produced strong evidence for the effectiveness of Qigong exercise in medical conditions such as falls associated with poor balance, cancer care and cardiac care. Wang's meta-analysis from 2013 examines studies of the psychological benefits of Qigong practice arising from eliciting the relaxation response, and also refers to studies targeting conditions such as hypertension.

One of the most commonly encountered issues in such meta-analyses is the lack of precise classification of the specific form of Qigong being practiced in the studies, and the frequent combination of data from studies where different forms of Qigong exercise were used (for example, Taiji and Qigong as in Oh's 2020 study). Although from the same family, the aims of these practices may differ considerably (for instance, longevity may be one desired outcome of self-care (*yǎngshēng*) practices that are common in Health Qigong), as does their actual execution and consequent effect on wellbeing.

A further area requiring more precise study is the ethnic background of participants. Asian participants' cultural heritage may predispose them to embracing the practice more rigorously and with greater expectation of efficacy. Whilst pointing to positive outcomes for participants, these studies remain inconclusive as to whether there is something intrinsic to the practice itself – that is, whether it is the balancing of the body's subtle energies – that may account for the significant results in improvement of medical conditions or mental health and wellbeing.

Inevitably, clinical studies are caught in one of the dilemmas of western medicine which is that the parameters for measuring health improvements are bound by the scientific theory and technology of the time. Science sets the gold standard for clinical research to be the double-blind test carried out in a laboratory or clinical setting. Within this paradigm, the lived-experience of the practices which in many studies are carried out in a wide variety of settings such as parks, gardens, or a village hall, is often considered anecdotal, subjective, and lacking consistency. It is not surprising, therefore, that clinical trials have limited means of assessing the premises upon which TCM is built. Interestingly, studies note the current limitations in instrumentation for detecting meridians, acupoints and energy centres (Klein, 2017), with the consequence that the subtle-energy-body remains unexplored in the West where there is little commercial motivation for investing in such research technology. On the other hand, research bodies in China, such the Qigong Centre at Jiangxi University of Chinese Medicine, are rapidly developing infrared and terahertz *qi*-monitoring technology as science continues to be a driving force for understanding Traditional Chinese Medicine and establishing it on an evidential footing (Zhang, 2020).

However, by turning to phenomenology as a useful art for capturing first person human experience, and by setting aside any cultural presumptions about the world view of TCM, we can enter into the lived-experience of the participants in the Qigong research project to understand their reported improvements in wellbeing. In doing so, phenomenology – an established approach in the West that has influenced a wide range of disciplines from systems theory to neuroscience and economics – may create a bridge to the TCM model of wellbeing and help to better integrate its practices as effective wellbeing interventions.

Elucidating experience: the phenomenological approach

The lived body, lived mind, and lived environment are all thus part the same process, the process by which one enacts one's world (in phenomenology speak, "brings forth a world").

(Rosch, 2016)

Overall, I find myself with more sustained energy levels, I can do more during the day without getting too tired, an improved quality of sleep, a calmer state of mind, more 'connected' to the whole in general and less fearful of what I can't see. My kidney function has improved (from my viewpoint) which led to improving my quality of life. I feel that I am making progress towards improving my life/health.

Participant ID 100

Yes recent practice makes me feel better connected with my body and my mind. It has just occurred to me that it's probably this new practice which is helping me move on. I have some issues in my life which my mind is wanting to resolve for a long time, and this week they are much in my mind in a "working on how to resolve them", so although they are not pleasant things to sort out, I am now working on how to move on from them.

Participant ID 61

Just as Qigong practice has its particular lineages, so phenomenology has its various trajectories within European philosophy. Husserl is considered to be its founding father, establishing as a valid basis for enquiry the study of how phenomena are perceived and experienced. Husserlian phenomenological bracketing (*epoché*) allows focus on first-person experiences whilst side-stepping any charge of solipsism. The experiences of others are also understood to be those of other consciousnesses (Hammond et al., 1991). Moreover experience,

mutually shared and understood by human beings, constitutes our lived-world with its contents and meanings.

Whilst Husserl's work has been hugely influential in the development of many disciplines, including some aspects of systems theory, it is, however, largely to Merleau-Ponty's work that we turn for a phenomenological approach that is most appropriate for mapping the experiences of Qigong practitioners. Taking case histories of clinical patients exhibiting various psychopathologies Merleau-Ponty compared these with the lived-experience of non-pathological, 'ordinary' cases. His work provides an extensive examination of the role of sense-perception in movement, and a ground-breaking account of embodiment as the incorporation of a lived-world. For this reason, his phenomenological approach provides illuminating ways of exploring Qigong practice as a therapeutic body-based exercise.

Applied to qualitative research, the phenomenological approach necessarily focuses on language as the primary medium for shared experience. This may be in the form of texts, conversations, interviews, and, in the case of the Qigong programme, diary entries. However, distinct from a hermeneutic approach where a text is mined for hidden meanings, the phenomenological approach drawn on in this study focuses quite specifically on identifying the role of sense perception in the experience of Qigong practice. Diary entries include extensive descriptions of physical sensations and emotional states relating to specific phases of the practice routine. Such emergent properties of first-person experience constitute the richness of meaning in life which clinical research may overlook, and which quantitative data alone may fail to capture: 'Facts of self-experience cannot be translated into objective facts without a decisive loss' (Fuchs, 2018). Using phenomenological methodology we may legitimately work with participants' diary entries to tease out the dynamics of their experience. Being intertwined with the lived-world, the first-person perspective has immediacy, authenticity, and credibility.

A final point to make about the phenomenological approach is that it takes into account not only the dynamics of perception and movement, but also acknowledges the cultural dimensions of lived-experience. In crossing cultural boundaries to fully engage with a practice inherited from a set of millennia-old Chinese traditions, participants engage in a creative process of reimagining and re-experiencing wellbeing from a new perspective. A key aspect of this perspective challenges many Western ideas of embodiment. The underlying principles of Chinese health-cultivation practices involve at least a basic appreciation of the body's subtle-energy field of meridians and energy centres, and a preparedness to think in terms of these during Qigong practice. In this context, the concept of the lived-body, as articulated by phenomenology provides us with a starting point for inquiry.

Embodied cognition: the body as the ground of experience

In analysing the participants' experiences, then, we look first to the lived-body as the ground of experience. Before they can fully experience the benefits of the practice, participants have to master the physical movements, concentrating on the correct posture and gestures. In this specific practice (and in contrast with other forms of Qigong), minimal attention is given to breathing. Instead, focus is mainly directed to the body (one of the three elements that combine

to form the living person), as well as sensing and feeling. Moreover, the means and purpose of Qigong cultivation is *bodily*, working on specific patterns of energy flow or blockage to optimise the whole of a person's life. My emphasis on starting with the body is therefore also coherent with phenomenology's descriptions of the fundamental features of human behaviour. As Merleau-Ponty (1945) reminds us: 'The body is our medium for having a world.'

The lived-world of first-person experience is characterised by *embodied* cognition, the means by which the enaction of our intentions, interests and life-designs is realised. Fuchs brings out this dimension when he writes, 'Embodiment does not come as an external addition to perception, but, rather, it is constitutive for it' (Fuchs, 2018). Upon closer scrutiny, several more basic constituents of experience can be teased out.

Maturana and Varela (1987) have developed the insights of phenomenology and encapsulated them at an organismic level in the concept of autopoiesis – that is, the processes of self-organisation that are common to all living beings. These processes involve motility and sensorimotor perception flowing from the organism into the surrounding environment, and, in the case of human beings, consciousness and intentionality giving rise to the enaction of a lived-world. The latter is the point of departure from generality of experience to individuation and the emergence of a sense of self. The underlying component structures of experience are summarised by Merleau-Ponty: 'Visual representations, tactile data and motility are three phenomena which stand out sharply within the unity of behaviour' (1945). It is a feature of self-organised entities that there is a constant back-and-forth flow of perception and movement towards, and from the surrounding environment. It is *from* our lived body that environment-oriented perception arises and feeds back *to* our lived-body a World which we incorporate and flow from (Leder, 1990). The key features of experience are also reflected in the processes at play in the Qigong practice. The practice distils elements of perception, movement, awareness of environment into a precise routine for cultivating the basic processes of life.

The paradox of embodied experience

Whilst phenomenology reveals a sound basis for exploring the role of embodiment in first-person experience, it has, however, given the body a rather problematic twist, with consequences for the exploration of wellbeing. Paradoxically, the body is both central and peripheral to lived-experience. In our normal 'outwardly oriented' perception of the world, phenomenology observes that we pay little attention to the body itself. For example, we do not consciously 'instruct' our legs to perform the action of walking. We simply enact walking across the room with a set purpose in mind, other than directing the movement of our legs. So, failure to pay attention to the body is not an act of absent-mindedness. It is a normal feature of enacting the lived-world that the body is generally *not* explicitly experienced. Our body, as the medium for experience is 'the hidden form of being oneself' (Merleau-Ponty, 1945). This ambivalent quality of the lived-body is also referred to by Fuchs: 'But if we take our self-experience of life as the starting point, the peculiar thing is that this experience lies precisely in a self-withdrawal. Our enactment of life is removed from immediate self-observation and always precedes any act of reflective determination' (Fuchs, 2018).

Leder's (1990) work is of particular interest in exploring how this aspect of embodiment is reversed in illness. In describing the 'alien presence' of a body in pain Leder highlights how our normally frictionless ability for enaction can suddenly break down when faced with the body's inability to function because of injury or pain. The body, or a specific body part is brought sharply into focus and becomes the subject of attention and concern. In these cases, seen in the context of the underlying structures of first-person experience, sense perception changes directionality. In illness, we shift focus specifically to our body, immersed in a bodily world tinged with pain, medical interventions and a suspension of our normal concerns and activities. Fuchs (2018) gives further nuance to this point suggesting that capacity for enaction within the lived-world is compromised, and the lived-body (*Lieb*) is transformed into an objectified physical body (*Körper*).

The diagram below (*Fig.2*) illustrates the dual mode of embodiment that characterises normal experience. On the one hand, our lived-world is one of *capacity*. In the lived-world, we are able enact immediate plans, actions and responses. In this mode the body is the *background* from which sensorimotor perception arises. On the other hand, when the potential for enacting the lived-world becomes limited by *incapacity*, such as a broken leg for example, our perception is forced back to the source of malfunction and the body becomes *foregrounded*.

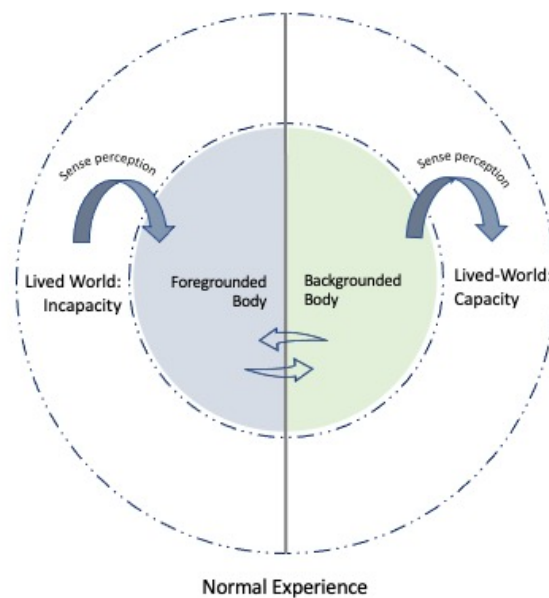


Fig.2 Dual mode of embodiment

Phenomenology would seem to suggest, then, that experience of the body is either *foregrounded* by our conscious perception, as in the case the pathological body; or *backgrounded* when enacting our normal, lived world. It should be noted, however, that in daily life these transitions of the backgrounded/foregrounded body are fluid and may switch not only from one moment to the next, but also in the degree to which the body becomes the focus of our attention. For example, when first learning the routine, participants' practice is punctuated by occasional pain or discomfort:

I'm struggling at the moment with sciatica and although I had warmed up prior to doing these exercises, today I could feel tense in my body because of the sciatica. This did dispel as the exercises continued which was good until I was unaware of it.

Participant ID 68

There are other examples where the focus on the foregrounded body is not necessarily pathological, but merely hindered. For example the not-yet-fluent-body learning to dance or play a musical instrument, or indeed, in learning to master the movements of the Qigong routine, as expressed by this participant:

As I am still on the initial practice sessions, I have to keep an eye on the video to check I am doing the exercises correctly, so that does reduce the opportunity to detach from thoughts and focus on the activity and visualise the inside of the body as requested.

Participant ID 40

How does this account of normal everyday experience relate to the wellbeing experience of the Qigong practitioners? The dual mode of embodiment described above would seem to suggest that embodiment which features the capacity to enact the lived-world is the domain of wellbeing. Under this model, in wellbeing the body disappears into the background, blissfully unaware of itself and free of pain or discomfort. However, authorities such as the World Health Organisation (2012) make it clear that wellbeing it is not to be defined merely by the absence of pain or disease but should include 'a complete state of mental, physical and social' wellbeing (WHO, 2012). Examination of TCM Qigong practice would suggest there is a third form of experiencing embodiment in which the body does not disappear from experience, but where, instead, it features specifically as the body-positive and the ground for cultivating wellbeing.

Wellbeing: the body-made-present

The third mode of experience specific to the TCM Qigong exercise is shown in *Fig. 3*. It is characterised by the *body-made-present*, a state attained by the performance of posture and movement combined with the surprising step of turning sensorimotor perception *inwards*, into the body's 'regions of silence' alluded to Merleau-Ponty and Leder. In the language of Qigong practice, this is the unified '*Qi State*' of mind, body and *qi*, and a mode of being which is a prerequisite for balancing the subtle-body energies and cultivating wellbeing. Unlike the foregrounded body of *Fig. 2* defined by incapacity and limited enaction of the lived-world, in Qigong practice the body-made-present is not objectified by sense perception. Instead, the body-made-present by sensory perception brings-forth the lived-world and becomes a living-subject actively transforming herself to be healthier, happier, more able to live life to the full. While this state may be sustained during the practice session, it may also spill over into daily life as the processes of transformation on psycho-spiritual-physiological levels continue beyond the practice itself.

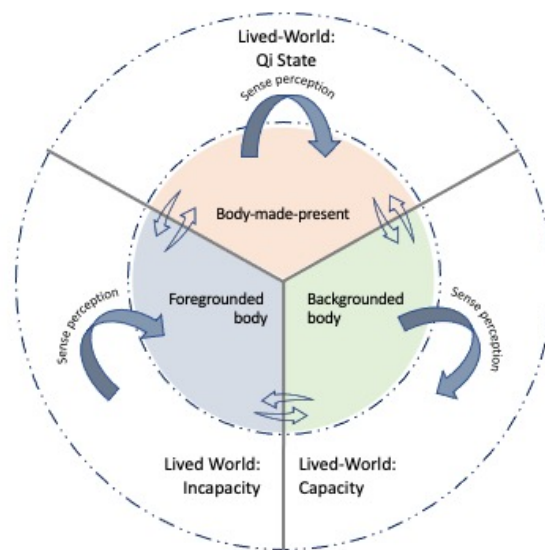


Fig. 3 Normal modes of embodiment and body-made-present

The diary entry below conveys how the experience of the body-made-present discloses new dimensions of the embodiment:

I could visualise and connect to my lungs easily but found it a little harder to connect to my other organs. However, I suddenly had the thought that my skin is an organ too and felt a strong connection and awareness of the skin covering all of my body. I found it easier to visualise qi today and felt that my different energy points were more strongly connected to one another.

Participant 43

The turning inward of sense perception discloses a mode of embodiment that is premised on the body being the source of life-energies that may be renewed by the powerful energies inherent in nature. By creating *positive* awareness of the body and skilfully manipulating these energies the body becomes a powerhouse for wellbeing. This positive model of embodiment contrasts with many Western and Asian philosophical and religious views of the body as the source of human weakness through its finite nature, the propensity of the senses to mislead, and as the source of physical suffering. It is also distinct from ideas of physical fitness where the body is disciplined into a specific shape and functionality by different forms of exercise such as aerobics, gymnastics or jogging. The sense of enlivening that the practice produces is captured by the diary entry below:

Qi means life force. I now believe it must have life in it as it can feel different each time I practice. Today it was much lighter and clearer than in previously practices. I feel qi strongly in my palms during the very first exercise and it has gotten stronger in

my feet when I think of connecting to qi from the ground. Qi sometimes feels like electricity to me, or a radiance, but today it felt more like the sensation you have when sitting in a light breeze. It felt gentle today.

Participant 43

The TCM Qigong practice thus serves to create a new perceptual field within the body's organismic and bio-energetic sphere. Through the accumulation of habit and repetition of the Qigong exercise the body becomes fluent in the practice routine but does not recede from conscious attention. On the contrary, embodiment is held in conscious focus throughout the exercise.

Introspective consciousness and the body-made-present

As with many other forms of Qigong exercise, an important feature of TCM Qigong is the meditative aspect involving focussed awareness. However, this does not equate with mindfulness methods familiar in the West, used for relaxation or stress reduction, even though at first sight these techniques seem to emphasise being present as key to their therapeutic value. One of the main proponents of mindfulness, Kabat-Zinn, brings out the distinctive feature of mindfulness practice as the development of a skill for 'the cultivation of our capacity to pay attention.' (Kabat-Zinn, 2018). In this respect, the mindfulness differs from the TCM Qigong practice where attention is specifically directed at the body. A further distinction, mindfulness practices derive from strands in Buddhist philosophy where the role of the body tends to be associated with suffering. For instance, Kabat-Zinn (2018) describes dis-ease as the basic constitution for many people, and mindfulness as a technique that can effectively identify damaging emotions, sensations, and behaviours before they become habitual and therefore harmful. So the techniques and goals of mindfulness are quite distinct from TCM Qigong's premise of cultivating the body's life energy in order to bring harmony and fulfilment to our life's concerns.

In TCM Qigong practice, the body is made-present by 'Introspective Consciousness' (*nèixiàng xìng yùnyòng yìshí* 内向性运用意识). Participants are guided by the instructor to turn vision, hearing and consciousness away from external objects of attention, and to sense *qi* energy within the body. Guided visualisation plays an important role in helping the participants direct *qi* energy through the various stages of the practice routine. Key to the practice, and continually stressed by the instructor is the experiencing of complete harmonisation of mind, body and *qi*. Participants describe this experience in various terms:

I love the way Qigong helps me to feel connected to myself. By focusing the mind on Qi and on the organs there is a sense of empowerment that I can look after my whole body. That I am not just an outer shell but there is so much more going on inside - I find that fascinating. Qigong shows me how to feel connected.

Participant ID 68

Yes, I feel more connected to myself than before the exercises. Like I am back in my body and not living in my head. Today I was able to detach from my thoughts by focusing more strongly on the sensation of qi and focusing on my internal organs. It also helped a lot to focus on the inside of my head as this released a lot of tension and a sense of overstimulation in my brain.

Participant 43

The Lived-World of TCM Qigong

As referred to earlier, there is in addition a cultural dimension of the practice. For the Qigong practitioners, this is a lived-world shaped by Traditional Chinese Medicine. The *Neijing Tu* map (shown in the Introduction) is an ancient Daoist depiction of the internal body which illustrates many principles that still relate to TCM practices today. It conveys the idea that in Qigong participants learn to inhabit a new internal landscape – or indeed a new World-scape – that has its own set of principles. One such principle is that human beings stand between Heaven and Earth (*tiān dì rén* 天地人). When in balance, human life is characterised by a harmony and wellbeing that is personal, societal and universal. This is not only a philosophical view based on a religious or moral understanding of the place of human beings in nature. It is also an observation of the processes that create equilibrium in lived experience.

Chinese cosmology presents the body as the microcosm of the macrocosm which is the universe (Colegrave, 1979). From the surface of our skin to our internal organs, the human body is alive with energy-centres and meridians which maintain life functions. The relationship between the macrocosm of our lived-world and the microcosm of the lived-body may be understood as that of unified harmony and constantly shifting points of balance that govern equilibrium. When out of balance, these energies may be adjusted by the intervention of an acupuncturist or TCM doctor, or, indeed, by the person themselves through prescribed exercise, such as the *Lung-Strengthening Qigong* routine.

To achieve the balanced ‘*Qi State*’, practitioners must first become familiar with the culture, landscape and ideas of wellbeing that belong to the practice. For many participants, its topography and meaning remain foreign territory until they master the physical movements that locate them within this interior World. This is achieved partly through the tutor’s explanations but mostly through the guided visualisation that is key to the exercise. The diary entries convey this process:

I could focus on the lungs and kidneys while moving the arms to circulate Qi. With a specific focus on anatomy I find it easy to focus. While I didn't really know where the dantian is, I felt this time a warm sensation in the area, I think it might be it. I felt warm

between my kidneys and lungs. I feel connected to myself, and discover sensations/feeling that I wasn't mindful of before.

Participant 68

In the unified state of the body-made-present, then, directing senses inward has the function of holding the gentle tension needed to maintain the present moment, and to experience the new dimensions that being present offers. Directed at the start of the routine by the tutor to 'look inside' and 'hear inside' their body, the TCM Qigong practice develops the participants' sense of sight, hearing, and touch to create awareness of their organs and, as if blind in a new environment, to feel the presence of their body Qi energy. These senses, which are at first faltering when turned inwards, gradually become sensitized and responsive to the inner environment. Participants start to bring-forth a new lived-world.

Conclusion

In exploring the experiences of Qigong practitioners phenomenology has provided a method for mapping wellbeing experience, and in doing so has disclosed a mode of embodiment that has not previously received much attention from phenomenological exploration. This mode is characterised by the body-made-present where sense perception is directed towards the body to reveal embodiment's inherently positive capacity for healing, health and wellbeing.

Moreover, a distinctive feature of this mode of embodiment is the cultural overlay provided by Traditional Chinese Medicine. In the Lung-Strengthening Qigong practice as well as in other related therapies, Traditional Chinese Medicine offers a paradigm of wellbeing that prioritises the holistic relationship between human beings and nature, and so has implications for the way we lead our lives as individuals in balance with ourselves, with others, and with our environment.

TCM Qigong practice combines purposeful movement and introspective consciousness as highly effective tools for cultivating *qi* energy throughout the subtle-energy body to attain a unitive state where mind, body and subtle-energies are harmonized. Practitioners' diary entries relate how they in effect incorporate a new culture, create a new sensorimotor field for perception and enaction, and thus create new meaning. Their diary entries attest to a process of positive change and transformation, and often a new sense of personhood which are the hallmarks of cultivation. This cultivation of embodied wellbeing is at the heart of Qigong practice.

References

Colegrave, S. (1979). *The Spirit of the Valley: Androgyny and Chinese Thought*, Virago.

Fan, F., Tuchman, S., Denninger, J.W., Fricchine, G., and Yeung, A. (2020). 'Qigong for the Prevention, Treatment, and Rehabilitation of COVID-19 Infection in Older Adults',

American Journal of Geriatric Psychiatry. DOI:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7227578/>

Fuchs, T. (2018). *Ecology of the Brain: The Phenomenology and Biology of the Embodied Mind*, Oxford University Press.

Hammond, M., Howarth, J. and Keat, R. (1991). *Understanding Phenomenology*, Blackwell.

Hsu, E. (1999), *The Transmission of Chinese Medicine*, Cambridge University Press.

Hung, S., Hwang, C. and Chang, C. (2021). 'Is the Qi experience related to the flow experience? Practicing qigong in urban green spaces' *PLOS ONE*. DOI: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0240180>

Kabat-Zinn, J. (2018). *Meditation is not what you think: Mindfulness, and Why it is so Important*, Hachette Books.

Kaptchuk, T. (1947). *The Web that has no Weaver: Understanding Chinese Medicine*, Macgraw-Hill

Klein, P., Picard, G., Baumgarden, J., Schneider, R. (2017). 'Meditative Movement, Energetic, and Physical Analyses of Three Qigong Exercises: Unification of Eastern and Western Mechanistic Exercise Theory', *Medicines*, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750593/>

Leder, D. (1990). *The Absent Body*, University of Chicago Press.

Maturana R. and Varela, F. (1987). *The Tree of Knowledge*, Shambala.

Merleau-Ponty, M. (1945, trans. 1962). *Phenomenology of Perception*, Routledge
Ming, P. (2014), *The Theory of Hunyuan Whole Entity: Foundation of Zhineng Qigong Science*, ZQ Educational Corporation.

Oh, B., Bae, K., Lamoury, G., Eade, T. (2020). 'The Effects of Tai Chi and Qigong on Immune Responses: A Systematic Review and Meta-Analysis', *Medicines* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7400467/>

Sardello, R. (2006). *Silence: The Mystery of Wholeness*, North Atlantic Books.

Schipper, K. (1993). *The Taoist Body*, University of California Press.

Shusterman, R. (2008). *Body Consciousness: A Philosophy of Mindfulness and Somaesthetics*, Cambridge University Press.

Sice, P., Elvin, G., Walton, L., Riachy, C., Rauch, L., Shang, Y. (September 2020). 'An autopoietic approach to assessing the impact of TCM Qigong exercise on wellbeing: A feasibility study', *Systemist*, 41(1), 108-132.

Sice, P., Elvin, G., Kurt, Z., Ogwu, S., Wong, P. and Xie, H. (2021). The Impact of Lung Strengthening Qidong on Well-being: a Case Study. Publication forthcoming.

Slingerland, E. (2019). *Mind and Body in Early China: Beyond Orientalism and the Myth of Holism*, Oxford University Press.

Varela, F. J., Thompson, E. and Rosch, E. (2016). *The Embodied Mind: Cognitive Science and Human Experience*, MIT Press

Wang, F., Man, K. M. J., Lee, E. O., Wu, T., Benson, H., Fricchione, G., Wang, W., and Yeung, A. (2013). 'The Effects of Qigong on Anxiety, Depression, and Psychological Well-being: A Systematic Review and Meta-Analysis', *Complementary and Alternative Medicine*, <https://pubmed.ncbi.nlm.nih.gov/23401706/>

Wilhelm, R. (1962). *The Secret of the Golden Flower*, Routledge and Kegan Paul.

World Health Organisation (2012). *WHO and Wellbeing at Work*, https://www.hsl.gov.uk/media/202146/5_kim_who.pdf

Zhang, W. (2020). *Lung-Strengthening Qigong Exercise*, Seminar at the University of Wales Trinity Saint David. <https://www.uwtsd.ac.uk/online/confucius-instituteonline-learning/qigong-for-health-online-courses/>.

An Online System for Consensus and Opinion Development in Human Networks

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Abstract

The Opinion Development System (ODS), an online system for consensus and opinion development was developed as part of a collaboration between Northumbria University and the National NHS-E Community of Action for Trauma Informed Care (TIC). The aim was to determine if an online tool can help a group of people in an organisation to reach consensus (agreement) on some statements relevant to their field. Gathering a range of opinions and building consensus on these topics would inform the direction and strategy for the organisation.

A discrete dynamic opinion development method is implemented in ODS using an Erdos-Renyi network as the underlying communication network to support opinion and consensus development towards achieving a common shared goal among users in a multi-agent system. Erdos-Renyi networks are classical random graphs of nodes with independent edges mimicking connections between nodes or individuals. Each ODS user is assigned to a network comprising a subset of the overall number of users and only sees the views of that subset.

Individuals working in key leaderships positions in health care TIC practice and recovery were recruited to trial the ODS. Five-day trials were conducted. In each case the system successfully established a network of connections between the participants (nodes), who then used it to view the opinion of others in their network on a topical issue and to regularly express their own views. The intention being to evaluate whether the sharing of views over time in such a network supports opinion and consensus development. The system did work as designed with users able to view the opinions of others and enter their own. Results indicated that there were changes in opinions which moved away from consensus (trial one) and towards consensus (trial two). However, there were an insufficient number of interactions to adequately measure consensus development fully (possibly due to staff workload) and to inform direction and strategy. We

concluded that further research to consider ways of engaging participants and achieving more and sustained interactions considering the user perspective was required, for example by using switching networks, with larger groups.

Key Words: consensus, human networks, multi-agent systems, trauma informed care.

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Introduction

The pattern of behaviour of human networks emerges from the micro-interactions of multiple agents. Consensus building in such networks presents a complex context where patterns of opinion emerge without an intended blueprint. The theory of complex systems suggests that imposing order in a complex context will fail, but setting the stage, stepping back, allowing patterns to emerge, and determining which ones are desirable will succeed (Snowden & Boone, 2007). Thus, consensus building models need to be concerned with setting the ‘right’ conditions for opinion development to occur.

The purpose of this paper is two-fold: - review models of opinion and consensus building in human networks; - introduce an online implementation of an opinion development system and its application with staff from a large mental health provider in the UK.

Consensus and Opinion Development in Human Networks

Reaching consensus in a group of agents has become a key research topic in the field of multi-agent systems, where each agent has a state value and an agreement between their states is to be reached via local interaction with neighbouring agents in continuous-time or discrete-time. Consensus problems have been extensively studied by many researchers in the areas of control theory, physics, management, robotics, and mathematics with a wide range of applications in sensor fusion, flocking and swarming, formation control, unmanned aerial vehicles, as well as biological and social networks (Jadbabaie et al., 2003; Olfati-Saber et al., 2007; Qin et al., 2017).

According to Olfati-Saber et al. (2007), consensus means to reach an agreement on a quantity of interest that depends on all agents. This definition is based on dynamic agents. Consensus entails all agents converging on or agreeing to a common shared goal by implementing necessary protocols that signifies a rule of interaction for each agent to exchange information with his or her neighbour. The underlying connectivity of a communication network takes an essential role in maintaining the consensus behaviour of the whole system. For example, in Jadbabaie et al. (2003), global connectivity is assumed to guarantee the consensus behaviour. The condition can be relaxed to requiring a spanning tree structure of the network (Ren & Beard, 2005) and random networks have also been considered (Tahbaz-Salehi & Jadbabaie, 2008). When the network under consideration has certain robustness meaning that some redundancy of edges exists in the structure, some faulty agents or malicious agents can be withstood (Shang, 2018b).

The convergence speed of agents’ states has been a key metric in gauging the effectiveness of the consensus in a multi-agent system. In Li et al. (2011), finite-time consensus, meaning that agents are able to reach a common value in only finite time, is achieved by incorporating signum functions into the control protocols. Distributed consensus protocols have been proposed in Shang (2017) to achieve finite-time group consensus when the whole network can be partitioned in some way to disjoint subnetworks. Fixed-time consensus problems have been solved for discrete-time (Liu et al., 2017) and continuous-time (Tian et al., 2019) multi-agent

systems, where the consensus time is independent to the initial states or configuration of the network.

In the setting of social dynamics, communication between agents are captured by a social network and the state of an agent is often handily represented by their opinion (Proskurnikov & Tempo, 2018). The consensus problem becomes a decision-making process in social networks which characterize a number of interesting social phenomena such as collective decision making, adoption of a belief, the rise and fall of a political party, polarization, and the emergence of fads, etc.

According to whether the opinion value of an individual is continuous or discrete, opinion consensus models can be roughly grouped into two classes. For continuous models, the H-K (Pineda et al., 2013) and Deffuant (Antonopoulos & Shang, 2018) models are two of the most popular opinion spreading models, where H-K uses the synchronized update rule while Deffuant uses asynchronous update. Both assume that individuals are only willing to change their opinions if their opinions are closer to those of others than a confidence threshold reflecting the limited confidence effect. In the category of discrete opinion models, prominent examples include the Galam majority-rule model (Galam, 2005), voter model (Herrerías-Azcué & Galla, 2019), and the Sznajd model (Karan et al., 2017). Surveys of various opinion dynamics in social networks can be found in Castellano et al. (2009) and Proskurnikov & Tempo (2018).

Chen et al. (2019) suggests that individuals' opinions in the real world are biased. Moussaïd et al. (2013) argue that at the scale of a social group, repeated influences among group members may lead to a complex pattern of opinion dynamics such as consensus formation, but also polarization and so on.

Shang (2020) shed more light on the difference between a private opinion and an expressed opinion. It was concluded that opinion distinction often arises when some individuals feel pressured in an interaction group to conform to the norm. A common reason for the difference between private and expressed opinion is the pressure an individual gets to conform in a group situation. This pressure from other individuals can make one agree to opinions or beliefs different from their private ones. An example of when an individual expressed public opinion differs from their private opinion is described in the field study by Waters & Hans (2009). They found that more than one third of jurors on criminal jury panels would have privately voted against the jury's panel final decision. This means that one third of the panel had a private opinion which was different from the final decision but had to conform to the opinions of others. A work by Kuran (2019) created the word preference falsification which describes a situation where an individual consciously or sub-consciously altered their true opinion to get their desired result. Thus, social influence brings about unpredictability in a system and may unfavourably impact decision making (Lorenz et al., 2011).

For the purpose of this research, it is thus considered important to develop an opinion building system that allows for anonymous participation while supporting maximum participation of all

users. The difference between the initial opinion of users and their final opinions will be analysed. Consensus levels will be explored.

Opinion Development System (ODS)

A discrete opinion dynamic method is implemented in the Opinion Development System (ODS) using an Erdos-Renyi network as the underlying communication network to support opinion and consensus development among users of the tool. Erdos-Renyi networks (Erdős & Rényi, 1959) are classical random graphs of nodes with independent edges mimicking connections between nodes or individuals. There has been a wealth of literature in mathematics on this topic and many recent applications have been found in network science and complex phenomenon in nature and society (Newman, 2018). For example, these networks have been used to study scholarly citation networks (Shang, 2018a) and globalization of natural resources (Tu et al., 2019).

In the context of our proposed opinion development system, users (i.e. nodes in the network) are required to register with the system in advance of the creation of the communication network and the start of the opinion and consensus development process. Basic demographic information like gender and age range is collected to facilitate later data analysis along with a unique username and password.

The ODS then creates a communication network for the registered users. An N by N random matrix with each element representing the existence or non-existence of a link between two users (nodes) in the network. A value of 1 in the matrix means there is contact between them while 0 means no contact. We specify the probability of turning 1 independently and hence the connections between two nodes are random and independent with any other connections. In this way, we create random Erdos-Renyi networks where each user is connected to a sub-set of the total number of users rather than all.

Users are next asked to login and read a statement. They are then asked to rate their level of agreement with it using a slider scale from 1 to 10, to express the reason for the rating and then to indicate their level of knowledge on the subject. This data is stored. Note that at this stage the user does not see the ratings or opinions of others. On subsequent occasions upon viewing the statement users are presented with and asked to view the agreement ratings of those with whom they connected to with the network. They are then asked to re-rate their current level of agreement with the statement and the reason for it and this data is again stored. These opinions were then available for the others in their network to view. Users are asked to login regularly and re-rate their level of agreement. Participants are anonymous to prevent individuals feeling pressured to conform to a group norm. By tracking changes in the levels of agreement over time we can evaluate the development of opinion building and consensus.

A self-monitoring facility is included with the ODS called 'My forum'. This allows users to view their own entries for agreement levels and the reasons for them as they develop over time to aid self-reflection.

Application of the Opinion Development System with staff from trauma informed care in a mental health provider in the UK.

Background/context

There is significant interest in integrating Trauma-Informed Practices into mental health and wellbeing in the UK. Both Scotland & Wales already devote national resources to trauma-informed public services. These services incorporate the understanding that people using them may have experienced trauma and that this trauma may have impacted on them in ways which would influence their interactions with that service, e.g., they may find it difficult to form trusting relationships and not feel safe in services. Trauma-informed services, instead, are delivered in ways that prompt safety and trust and do not re-traumatise. The most crucial shift involves shifting from the thinking ‘what is wrong with you’ to ‘what happened to you’ (Harris & Fallot, 2001; Thirkle et al., 2018).

Policy and practice development and the implementation of TIC requires an ongoing participative approach (Thirkle et al., 2018). The ODS (described above) provides a structure for maximum participation and opinion sharing for each member of a group or community regardless of their status.

Individuals working in key leaderships positions, in trauma informed practice and recovery were recruited to trial the ODS. In total 14 participants were recruited which included programme managers, senior clinicians across a range of services (including adult, child and adolescents, forensic and learning disability), researchers and experts by experience - individuals who have accessed mental health services and are now employed by the NHS to help improve services. All participants were recruited using an invitation email which outlined the methodology and joining instructions. Ethics approval for the study was granted from Northumbria University, Newcastle.

The statements identified and used for opinion development in the ODS trial were current issues within the trauma informed care programme. The issues were recognised within programme management discussions and conversations between the programme lead, manager and senior researcher. Gathering a range of opinions and building consensus on these topics would inform the direction and strategy on the implementation of trauma informed care across the service. There were two trials. The statements used were:

1. Trial 1: The implementation and embedding of Trauma Informed Care in your service is dependent on engagement of senior leaders who are not involved in direct care.
2. Trial 2: We have limited budget on the Trauma Informed Care Programme. It is important to spend a significant amount on research in order to create an evidence base.

The system was open for five days for each trial, with participants encouraged to enter an opinion daily, based on their experience, knowledge and other participants opinions, available from day 2 onwards. All opinions submitted into the system remained anonymous.

First Trial

Fourteen participants registered with the ODS for the first trial out of which twelve entered opinions over a period of five days. The users were invited to give an agreement score regarding the given statement and to enter a relevant opinion, and to repeat the process regularly.

The engagement of the participants with the trial measured by the number of opinions each entered is shown in Table 1. Only 3 participants entered 5 or more opinions. There were 9 participants who engaged two or more times, while 3 participants engaged only once. The most engagement was for 3 rounds (4 participants).

Table 4 Participants' engagement for the first trial.

Number of opinions	1	2	3	4	5	6	7
Number of participants	3	1	4	1	1	1	1

The evolution of the agreement scores at each round of the trial is shown in Figure 1. Six out of the nine participants who engaged more than once changed their agreement score at least once through the course of the experiment, indicating that they have indeed been influenced by others' opinions. The biggest change in agreement for one participant was by 5 (from an agreement score of 10 to 5) for participant 12.

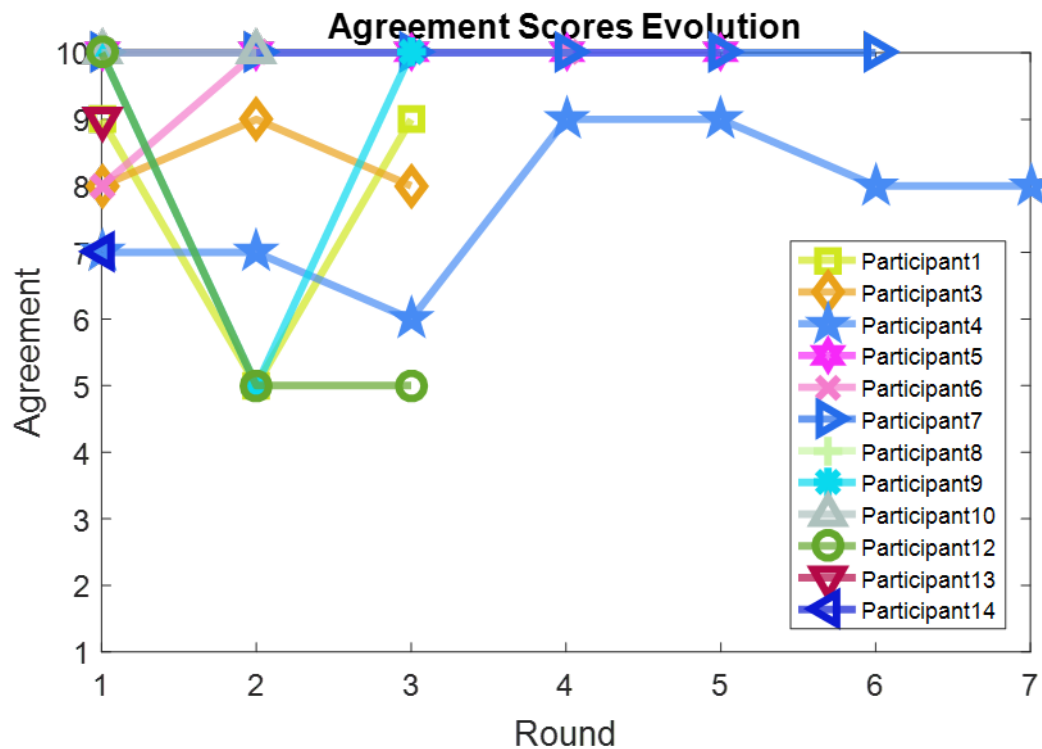


Figure 1 Opinion evolution for the first trial.

Second Trial

The second trial used a different statement. Thirteen participants registered for this trial out of which nine entered opinions at least once during the five days period. The level of engagement in this trial is shown in Table 2. Only 1 participant entered 5 opinions. There were 7 participants who engaged two or more times, while 2 participants engaged only once.

Table 5 Participants' engagement in the second trial.

Number of opinions	1	2	3	4	5
Number of participants	2	2	2	2	1

The evolution of the agreement scores at each round of this trial is shown in Figure 2. Five out of the seven participants who engaged more than once changed their agreement score at least once throughout the trial. The largest change in agreement scores is by 2, from 8 to 10 for participant 1, from 9 to 7 for participant 4, and from 4 to 6 for participant 11.

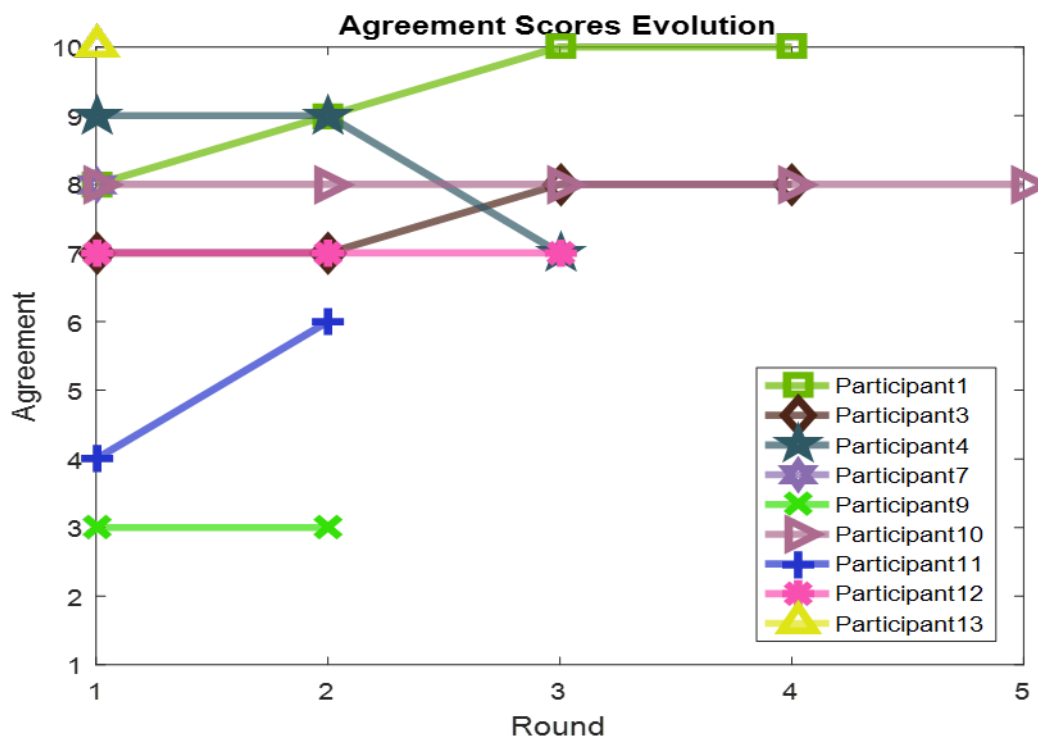


Figure 2 Opinion evolution for the second trial.

Summary Statistics

Since only a few participants engaged for the full five-day period by entering 5 opinions at least during both trials, we assume in the following that the last opinion given by a participant,

no matter at which round, reflects an unchanged score afterwards. Although this assumption is reasonable, it may not be always valid. Ceasing to engage could be caused for instance by a lack of time, lack of interest in the topic, or other reasons unrelated to the participant having made a final decision on the statement.

We then compute simple statistical measures to compare the distribution of the agreement scores at the initial and final stages, such as mean, variance and range. They can be seen in Table 3. For the first trial, the initial average level of agreement with the statement was 9 at the first round, it became 8.83 after the final round. The variance was initially 1.45, changing to 2.51, and the range (maximum – minimum) changed from 3 to 5. For the second trial, the initial average level of agreement with the statement changed from 7.11 at the first round to 7.44 at the final stage. The variance was initially 5.11 and became 4.53, and the range remained unchanged at 7.

Table 6 Summary statistics for both trials.

	Trial 1		Trial 2	
	Initial	Final	Initial	Final
Mean	9	8.83	7.11	7.44
Variance	1.45	2.52	5.11	4.53
Range	3	5	7	7

Discussion

The Opinion Development System model was implemented successfully. Figures 1 and 2, show the data entries for each participant. Appendix A includes screen shots of the system, including opinions shared by participants. From the responses in Figure 1 we can see that those participants with more than two entries (participants 3, 4 and 12) did amend to an extent their initial opinions, as a result of viewing the opinions of their neighbours. The system works according to the structure described in the system implementation, with Erdos-Renyi network of neighbour nodes successfully established as a communication network to support opinion and consensus development. Users could review the opinions of the other participants they were connected to within the network on a given topic and were able to express their own opinions on it. These opinions were then available for the others in their network to view.

Data entries were analysed for convergence. From Table 3 we can draw the following observations. First, the mean value changes from an initial 9 to a final 8.83, which means that the opinion evolution shows a slightly decreasing trend in term of the score. We believe that this is most likely due to the workload of the participants (NHS staff). In order to commit time to discussion, they need to see this process as having more value than other tasks needing their attention. Other issues may include the homogeneity of the participants or a lack of challenge

in the topic. Second, the variance value increases from 1.45 to 2.52, which together with the change of range from 3 to 5 indicates that the opinions diverged during the evolution process. This can be explained as follows. Starting from the 4th round, only three participants (participants 4, 5, and 7) were still using the system involved and the number further drops to two starting from round 6. This implies that the underlying interaction network becomes literally too sparse to be adequately connected. Therefore, the consensus reaching assumptions (Ren & Beard, 2005) no longer hold. Third, the second trial suffers from similar issues. However, the drop of variance (in this case from 5.11 to 4.53) sheds a light on the consensus mechanism in action. The final opinion configuration shows a better focus compared to the initial opinion configuration.

This is research in progress. The system is at a prototype stage, and participants were asked to engage in exploring opinions. Following each opinion development and consensus building trial, the design team collected feedback from participants and reflected on the findings. From the perspective of the participants, it was important that they could see the anonymised opinion of other participants, as well as track the development of their opinions. The second trial revealed the need for more flexibility in adding actors to the network and this will be considered as a future development. The iterative approach of development allows for taking on board the requirements of the users.

The limitations of the studies are: a small number of participants; insufficient iterations of interactions over the communication network. As discussed, the limitations were possibly due to the participants being NHS staff who had little time to engage with the system.

Conclusion and recommendations for further research

A discrete opinion dynamic method was successfully implemented in the Opinion Development System (ODS) using an Erdos-Renyi network as the underlying communication network to support opinion and consensus development among users of the tool. The system functionality worked as designed with users able to view the opinions of others and enter theirs and participants found the system easy to use, however, there were insufficient iterations of interactions over the communication network to reach consensus. Further research will be required to consider ways of engaging participants in more sustained interaction considering the user perspective. For example, the tool currently forms a communication network where individuals exchange opinion through a fixed neighbourhood to support communication and opinion sharing. However, to work this requires all nodes to be present (registered on the system) for the network connections between people to be formed. As users tended to register over a period of a week or more, that meant that they couldn't start to interact for some time in some cases. A consequence of this was a perceived drop in user enthusiasm. We suggest using random or switching networks (Suo, 2008; Pan, 2021) and allowing the network to grow over time by letting new users join so that the network is time variant (Oliva, 2012; Li, 2019] in future work. With this approach, upon registration the user will immediately be able to rate their agreement and express/share their views. As each new user joins the network, they will be added and the connections will be switched to allow each user to see a potentially different

set of views and therefore the opportunity to absorb more opinions, interacting with different network neighbours as time goes on. These changes may also lead to quicker consensus formation.

Using switching networks may better reflect real social networks where we interact with different people to exchange opinions on a topic in homes/gyms/bars/workplaces/etc. and our collaborators evolve with time.

To further improve usability we also suggest enhancing the way opinions are viewed. Currently participant only see the two most recent posts from each person in their network. Instead, they we could allow them to see all of their views over time and their own in a scrollable area to support consideration of opinion development. This will provide a 'chat' like discussion board interface that is more familiar to users and so may encourage participation. In addition, we suggest providing graphs for the user depicting how their own agreement rating and the average rating of their network neighbours has changed over time, supplying users with further evidence to support opinion development.

The aid the next stage of development we will collect mini narratives followed by interviews with participants, to explore how they use the system and what cultural assumptions and beliefs influence their motivation, and participation. The Appreciative Inquiry Method (AIM) (Stowell, 2013) will be used during the interviews to elicit first individual and then second a combined map of user requirements. The ODS prototype can be adapted to accommodate the requirements and context of the user.

We also suggest that the context and timing of participation with the ODS need to be considered as well as topics that provoke more debate, including ones that are broader in nature to interest a wider audience, so that clear trend may be shown along the evolution of opinion and the development of consensus. In particular we propose to:

1. Link an ODS opinion and consensus building exercise to a large national webinar to see if the process of engagement with ideas in the webinar motivates people to participate with the consensus tool. This will also hopefully engage sufficient users to provide more robust data for analytics around the processes of decision making.
2. Explore whether the tool is valuable as a single user instrument for gathering opinion on a subject rather than creating changes.
3. Link the evaluation of the subjective experience of using the tool to expand the system of interest and involve the users in exploring the transformation that they would consider valuable, to inform further systems development (Stowell and Welch, 2012).

References

Antonopoulos, C. G., & Shang, Y. (2018). Opinion formation in multiplex networks with general initial distributions. *Scientific Reports*, 8(1), 2852. DOI <https://doi.org/10.1038/s41598-018-21054-0>.

- Castellano, C., Fortunato, S., & Loreto, V. (2009). Statistical physics of social dynamics. *Reviews of Modern Physics*, 81(2), 591. DOI: <https://doi.org/10.1103/RevModPhys.81.591>.
- Chen, Z., Qin, J., Li, B., Qi, H., Buchhorn, P., & Shi, G. (2019). Dynamics of opinions with social biases. *Automatica*, 106(1), pp.374-383. DOI: <https://doi.org/10.1016/j.automatica.2019.04.035>.
- Erdős, P., & Rényi, A. (1959). On random graphs I. *Publicationes Mathematicae*, 6 (1959), 290-297.
- Galam, S. (2005). Local dynamics vs. social mechanisms: A unifying frame. *Europhysics Letters*, 70(6), 705. DOI: <https://doi.org/10.1209/epl/i2004-10526-5>.
- Gambuzza, L. V., & Frasca, M. (2021). Distributed control of multiconsensus, *IEEE Transactions on Automatic Control*, 66(5), 2032-2044. DOI: DOI: 10.1109/TAC.2020.3006820.
- Harris, M., & Fallot, R. D. (2001). Envisioning a trauma-informed service system: a vital paradigm shift. *New Directions for Mental Health Services*, 89(1), 3-22. DOI: <https://doi.org/10.1002/yd.23320018903>.
- Herreriás-Azcué, F., & Galla, T. (2019). Consensus and diversity in multistate noisy voter models. *Physical Review E*, 100(2), 022304. DOI: <https://doi.org/10.1103/PhysRevE.100.022304>.
- Jadbabaie, A., Lin, J., & Morse, A. S. (2003). Coordination of groups of mobile autonomous agents using nearest neighbor rules. *IEEE Transactions on Automatic Control*, 48(6), 988-1001. DOI: 10.1109/TAC.2003.812781.
- Karan, F. S. N., Srinivasan, A. R., & Chakraborty, S. (2017). Modeling and numerical simulations of the influenced Sznajd model. *Physical Review E*, 96(2), 022310. DOI: <https://doi.org/10.1103/PhysRevE.96.022310>.
- Kuran, T. (1993). Private truths and public lies. Boston: Harvard University Press.
- Li, M., & Dankowicz, H. (2019). Impact of temporal network structures on the speed of consensus formation in opinion dynamics. *Physica A*, 523(1), 1355-1370. DOI: <https://doi.org/10.1016/j.physa.2019.04.206>.
- Li, S., Du, H., & Lin, X. (2011). Finite-time consensus algorithm for multi-agent systems with double-integrator dynamics. *Automatica*, 47(8), 1706-1712. DOI: <https://doi.org/10.1016/j.automatica.2011.02.045>.
- Liu, J., Yu, Y., Wang, Q., & Sun, C. (2017). Fixed-time event-triggered consensus control for multi-agent systems with nonlinear uncertainties. *Neurocomputing*, 260(1), 497-504. DOI: <https://doi.org/10.1016/j.neucom.2017.04.061>
- Lorenz, J. (2007). Continuous opinion dynamics under bounded confidence: A survey. *International Journal of Modern Physics C*, 18(2), 1819-1838. DOI: <https://doi.org/10.1142/S0129183107011789>.
- Lorenz, J., Rauhut, H., Schweitzer, F., & Helbing, D. (2011). How social influence can undermine the wisdom of crowd effect. *Proceedings of the National Academy of Sciences of*

the United States of America, 108(22), 9020-9025. DOI:
<https://doi.org/10.1073/pnas.1008636108>.

Monaco, S., & Celsi, L. R. (2019). On multi-consensus and almost equitable graph partitions, *Automatica*, 103(1), 53-61. DOI: <https://doi.org/10.1016/j.automatica.2019.01.021>

Moussaïd, M., Kämmer, J. E., Analytis, P. P., & Neth, H. (2013). Social influence and the collective dynamics of opinion formation. *PLoS ONE*, 8(11), e78433. DOI: <https://doi.org/10.1371/journal.pone.0078433>.

Newman, M. (2018). *Networks*. Oxford University Press.

Olfati-Saber, R., Fax, J. A., & Murray, R. M. (2007). Consensus and cooperation in networked multi-agent systems. *Proceedings of the IEEE*, 95(1), 215–233. DOI: [10.1109/JPROC.2006.887293](https://doi.org/10.1109/JPROC.2006.887293).

Oliva, G., Panzieri, S., Priolo, A., Ulivi, G. (2012). Adding and removing nodes in consensus. *20th Mediterranean Conference on Control & Automation*, 2012, pages 1031-1036. DOI: [10.1109/MED.2012.6265774](https://doi.org/10.1109/MED.2012.6265774).

Pan, L., Shao, H., Mesbahi, M., Xi, Y., D. Li. (2021). Consensus on matrix-weighted switching networks. *IEEE Transactions on Automatic Control*, 2021, DOI: [10.1109/TAC.2021](https://doi.org/10.1109/TAC.2021).

Pineda, M., Toral, R., & Hernández-García, E. (2013). The noisy hegselmann-krause model for opinion dynamics. *European Physical Journal B*. 86(12), 1-10. DOI: <https://doi.org/10.1140/epjb/e2013-40777-7>.

Proskurnikov, A. V., & Tempo, R. (2018). A tutorial on modeling and analysis of dynamic social networks. Part II. In *Annual Reviews in Control*. 45(1),166-190. DOI: <https://doi.org/10.1016/j.arcontrol.2018.03.005>.

Qin, J., Ma, Q., Shi, Y., & Wang, L. (2017). Recent advances in consensus of multi-agent systems: A brief survey. In *IEEE Transactions on Industrial Electronics*. 64(6), 4972-4983. DOI: [10.1109/TIE.2016.2636810](https://doi.org/10.1109/TIE.2016.2636810).

Ren, W., & Beard, R. W. (2005). Consensus seeking in multiagent systems under dynamically changing interaction topologies. *IEEE Transactions on Automatic Control*. 50(5), 655-661. DOI: [10.1109/TAC.2005.846556](https://doi.org/10.1109/TAC.2005.846556).

Schweighofer, S., Garcia, D., Schweitzer, F. (2020). An agent-based model of multi-dimensional opinion dynamics and opinion alignment. *Chaos*, 30(9), 093139. DOI: <https://doi.org/10.1063/5.0007523>.

Shang, Y. (2017). Finite-time cluster average consensus for networks via distributed iterations. *International Journal of Control, Automation and Systems*. 15(2), 933-938. DOI: <https://doi.org/10.1007/s12555-015-0407-2>.

Shang, Y. (2018a). A note on the H index in random networks. *The Journal of Mathematical Sociology*, 42(2), 77–82. DOI: <https://doi.org/10.1080/0022250X.2017.1403438>.

Shang, Y. (2018b). Resilient consensus of switched multi-agent systems. *Systems and Control Letters*. 122(1),12-8. DOI: <https://doi.org/10.1016/j.sysconle.2018.10.001>.

Shang, Y. (2020). Consensus and Clustering of Expressed and Private Opinions in Dynamical Networks against Attacks. *IEEE Systems Journal*. 14(2), 2078-84. DOI: 10.1109/JSYST.2019.2956116.

Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard Business Review*. 85(11), 68.

Stowell, F. (2013). The appreciative inquiry method—A suitable candidate for action research? *Systems Research and Behavioral Science*, 30(1), 15-30. DOI: <https://doi.org/10.1002/sres.2117>

Stowell, F. A., & Welch, C. (2012). *The Managers Guide to Systems Practice*. Wiley. <https://onlinelibrary.wiley.com/doi/book/10.1002/9781119208327>

Suo, S., Chen., Y. (2008). The dynamics of public opinion in complex networks. *Journal of Artificial Societies and Social Simulation*, 11(4), article 42, 2.

Tahbaz-Salehi, A., & Jadbabaie, A. (2008). A necessary and sufficient condition for consensus over random networks. *IEEE Transactions on Automatic Control*. 53(3), pp.791-795. DOI: 10.1109/TAC.2008.917743.

Thirle, S. A., Kennedy, A., & Sice, P. (2018). A Case for TIC: A Complex Adaptive Systems Enquiry for Trauma Informed Care. *International Journal of Systems and Society (IJSS)*, 5(2),1–12. DOI: DOI: 10.4018/IJSS.2018070101.

Tian, B., Lu, H., Zuo, Z., & Yang, W. (2019). Fixed-time leader-follower output feedback consensus for second-order multiagent systems. *IEEE Transactions on Cybernetics*. DOI: 10.1109/TCYB.2018.2794759.

Tu, C., Suweis, S., & D'Odorico, P. (2019). Impact of globalization on the resilience and sustainability of natural resources. *Nature Sustainability*. 2(4), 283–289. DOI: <https://doi.org/10.1038/s41893-019-0260-z>.

Waters, N. L., & Hans, V. P. (2009). A Jury of One: Opinion Formation, Conformity, and Dissent on Juries. *Journal of Empirical Legal Studies*, 6(3), 513-40. DOI: <https://doi.org/10.1111/j.1740-1461.2009.01152.x>.

Yang, Z.H., Song, Y., Zheng, M. and Hou, W.Y. (2016). Consensus of multi-agent systems under switching agent dynamics and jumping network topologies. *International Journal of Automation and Computing*, 13(5), pp.438-446. DOI: <https://doi.org/10.1007/s11633-016-0960-z>

Appendix A

NHS Forum Statement

Home Statements Username Password Logon Register

We have limited budget on the Trauma Informed Care Programme. It is important to spend a significant amount on research in order to create an evidence base

Please read the views of others on the right (if there are any) then complete the form using the slider bar(s) and by entering an explanation in the box provided

To what extent do you agree with the statement? 0 10

Please provide an explanation for your view

To what extent was your opinion based on your reading and awareness of the subject? 0 10

To what extent was your opinion based on practical experience of the subject? 0 10

To what extent was your opinion influenced by your feelings? 0 10

To what extent was your opinion influenced by your own experience of having used services? 0 10

Figure 3 The view of the ODS screen to express an opinion the first time the user sees a given statement.

NHS Forum Statement

Home Statements Username Password Logon Register

We have limited budget on the Trauma Informed Care Programme. It is important to spend a significant amount on research in order to create an evidence base

Please read the views of others on the right (if there are any) then complete the form using the slider bar(s) and by entering an explanation in the box provided

To what extent do you agree with the statement? 0 10

Please provide an explanation for your view

Other people's views
(including how much they agreed)

User 10
We need to evidence what works to ensure that a paradigm shift from what is wrong with you to what happened to you?
To ensure that commissioning in future is TIC based (8/10)

We need to evidence what works to ensure that a paradigm shift from what is wrong with you to what happened to you?
(8/10)

Figure 4 The view of the ODS screen to express an opinion on subsequent occasions, including two opinions and their ratings from another user in the network.

Reframing social work assessment: Connecting spaces and people

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Abstract

This paper seeks to reframe social work assessment, reflect on complexity, autopoietic theory, narrative, and life stories, and introduces a conceptual interactive practice tool, Connecting Spaces. This tool is being designed to facilitate assessments and therapeutic work with children and vulnerable adults in person and online. Social work is concerned with systems involving people, often during crisis, their environments, and networks where engagement and assessment cannot function outside of communication between assessor and assessed. Social workers are nested within their own personal, biological, and professional networks including employing agency and professional regulatory bodies. Complexity arises because social workers must condense information into stories of what might happen and make sense how best to support people. Munro (2011) in her review of child protection explains social workers try to understand and help people and she reflects on the interplay between conscious analysis and intuition in assessment and decision making. Ten years on from Munro's recommendations The Case for Change (Children's Social Care Independent Review, 2021) highlights the continued need for less bureaucratic process-led practice and more direct work with children and families.

Given the prominence of attachment theory in social work, it is a surprise Siegal's Mindsight, which is the capacity to clarify, label and analyse the internal emotional world and its response to the external world, has gained little attention in social work. The potential for Mindsight's application in social work is enhanced by narratives, storytelling and life story therapy with children and vulnerable adults. Connecting Spaces can be used to create a narrative about the person's life: past, present and/or future. The aim is to inform and improve decision making by enabling the person's understanding, views, wishes and feelings to be explored, heard, presented, evidenced, and considered. Further, it has the potential to present and consider multi-perspectives and narratives such as in family and wider systems. This flexible communication conceptual tool is designed to have a range of uses and it is intended to be provided in both digital and physical form to suit a range of needs. This tool does not aim to

replace but to enhance building relationship, safety, and communication in direct work with a child or vulnerable adult.

Key Words: social work assessments/ practice, autopoiesis social systems, narratives, communication, self-regulation, compassion, mindsight, polyvagal theory, therapeutic life story work

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Introduction

The purpose of this article is to reflect on social work practice – principally assessments and ongoing therapeutic-based direct work. The paper has taken years to germinate and is the result of conversations by three people, a social work academic, an independent social worker specialising in therapeutic life story work and a well-being informatics academic. During our collaborations we have come to realise we share a passion in compassion-based practice within social care. Social work is a key social care profession which is concerned with systems involving people, often during crisis, their environments, and networks where engagement and assessment cannot function outside of communication between assessor and assessed. Social workers are nested within their own personal, biological, and professional networks including their employing agency and professional regulatory bodies (such as Social Work England). Complexity arises because social workers must condense information into stories of what might happen and make sense how best to support people (Heslop & Meredith, 2019; Munro et al., 2017). Munro (2011), in her review of child protection, explains social workers try to understand and help people and she reflects on the interplay between conscious analysis and intuition in assessment and decision making. Through this article the authors seek to identify some difficulties in social work assessments, not by blaming practitioners or those being assessed but to appreciate the process of assessment. Through the lens of autopoietic social systems this article suggests communication is the means to reproduce a social sub-system through the assessor's understanding, or sense-forming. From this position the authors seek to offer an alternative based on compassion, mindsight and communication and introduce a conceptual design to facilitate more effective storytelling and narrative-based assessments.

Scene Setting: Social Work Practice and Theory

Social workers undertake assessments to inform decisions about how to intervene with people in situations of need and risk, and the decisions they make can have an enormous impact on people's lives (Heslop and Meredith, 2019). In England Social Work is a legal title and regulated profession through Social Work England. Alongside the complexity of decision making, children and vulnerable adults live within complex environments. Social work is many things to different people and is often misunderstood as there are differing expectations of social work, which range from implementing social justice within a political agenda to enforcing safeguarding legislation and conformity to societal rules. Social work is about making sense of complex and difficult situations so that they can understand how to navigate towards solutions. Assessments for practice include an assessment to understand the person, their circumstances and needs and continual assessments and reassessments during ongoing work with people. Consider a long journey, the initial large-scale assessment will map out the journey, decide mode of transport etc., but during the journey assessment is continuous to appraise progress, take in new information etc. So, it is with professional practice, the initial assessment may implement a care plan involving direct therapeutic life-story work with a child, but each session of direct work will involve its own assessment of how to progress and take in new information. To inform assessments practitioners incorporate a range of knowledge, theories, and interventions. Children services in England work with a wide range of people and families; at end of March 2020 there were 389,260 children in need (who require local authority support) which represents 323.7 children per 10000, while 51,510 children had a child

protection plan, representing 42.8 children every 10000 (Department for Education, 2020b) and there were 80,080 children looked after by English local authorities in 2020 (Department for Education, 2020c). These statistics highlight the volume of systemic interaction between families, children, children's social services, and social workers. What remains relatively unknown is the actual nature of these interactions.

Echoing previous reviews (for example see Munro's review of child protection, 2011), *The Case for Change* (The Independent Review of Children's Services, 2021) highlights the need for less bureaucratic process-led practice and more direct work with children and families. While direct work is viewed as the greatest asset that children's social care has it appears grossly underused as statistics suggest that one in three of all social workers in children's services do not work directly with children or their families (Department for Education, 2020a), and those in direct practice spend less than one third of their time with families. *The Case for Change* interim report states,

Children, families and professionals have all told the review that too often the social care system doesn't (sic) live up to our aspiration of supporting families to provide safety, stability and love to children, leaving social workers with insufficient time and resources to do the vital work with children that inspired them to enter the profession (The Independent Review of Children's Services, 2021).

Regardless of the duration, type, or focus of any ongoing direct social work, all children and families involved in children's social services will have been assessed and assessment is a key function of social work (Heslop and Meredith, 2019).

Social work exists at the crossroads where social issues and social change intersect and social workers often assess people during crisis to ascertain need and access to social services. Professional assessments require practitioners to understand how to incorporate a range of knowledge, theories, and interventions as they seek to understand a person's circumstances and needs (Adams et al., 2009; Healy, 2014; Oko, 2011). There is much theoretical emphasis on co-production between practitioner and service recipient, through for instance task-centred practice (McGinnis, 2013; Reid, 1997), social systems and environments (Bronfenbrenner, 1979), personalisation (Stevens et al., 2018), power (Green & Featherstone, 2014), relationship-based practice (Ruch et al., 2010), and anti-oppressive practice (Dominelli, 2002). Social workers apply theory to practice all the time – consciously and unconsciously using formal and informal theories. Beckett (2018) differentiates between formal theories which have a recognisable proponent or theoretician, and informal theories, which cannot be attributed to a recognisable theoretician, but nonetheless inform how social workers assess, form opinions, and decide on interventions. However, theory is not truth, rather it is an interpretive tool, a tool which facilitates or enables an understanding. Truth is perceived differently, and there are different perspectives and opinions on the same situation without either being wrong or right. Theories are not constant; they evolve and emerge in response to systemic, cultural, and environmental variants. Theories emerge to challenge existing ones and ideas which were once viewed as fact become defunct, such as the earth being flat. It is helpful to view theories as

fuzzy concepts that exist to understand or explain phenomenon. Fuzziness occurs when the boundaries and application of information are not clear-cut and can vary considerably according to context and fuzziness helps to explain theory is less concrete, and more subjective, than it at first seems. From this perspective it is important to consider who arbitrates what is true and how opinions are formed, and assessments can only be informed opinion. Klein (1998;2004) and Kahneman (2011) identify the cognitive processes involved in recognising patterns, analysis, and intuition in forming opinions and assessing situations. Quite simply humans select information, consciously and unconsciously, to make sense of situations and therefore assessments, along with theorising, are highly subjective as they involve a human assessor.

Through theories for practice, it is argued, social workers can exercise different possibilities of understanding people's needs and the purpose of their own practice. The act of theorising during assessment acknowledges the subjectivity inherent in assessment and professional sense-forming. Identifying theories for practice and assessment should result in more transparency and increased objectivity. Garrett (2018) argues contemporary social work operates within four competing and distinct theoretical approaches: therapeutic, socialist-collectivist, individual reformist, and managerialist-technocratic perspectives. The ways practitioners interact with these theoretical approaches influence practitioner' opinion, whereby a Marxist, within the socialist-collective approach, may be more in-tune with issues relating to poverty than a proponent of neoliberalism, within the managerialist-technocratic approach, who may be more in-tune with markets in the management of services. In contrast to Garrett, Healy (2014) provides a dynamic approach to theory and models of practice, classifying contemporary social work theory into five categories: systems theories, problem-solving theories, strengths and solution-focused theories, modern critical social work theories and post-modern theory. Theories are therefore seen as the means to organise and present understandings and interpretations. They are explanations and mechanisms to communicate how we experience phenomenon and perceive the world we inhabit. Theories are also the ways individuals create the world they inhabit, consider any fundamentalist, political or religious, and how they perceive reality in contrast to others who do not share their worldview.

Practice-based assessments are difficult and despite efforts to standardise them, through statutory (see Department for Education, 2018) and practice frameworks, such as Signs of Safety (Turnell, 2012); the practitioner input, conscious and unconscious, maintains a strong influence on the assessment. The evidence regarding childcare assessments is social workers tend to focus on negative aspects of children's identities (Thomas & Holland, 2009), select information already contained in case files (Hackett & Taylor, 2014), focus on static family functioning in the present rather than adaptive capacity (Platt & Riches, 2016), focus on safeguarding (Heslop et al., 2019), and practice frameworks attempt to regulate assessor subjectivity in line with potential safeguarding concerns (Baginsky et al., 2020). It seems interpretation and opinions, key aspects of assessment, hold sway on the assessment process which may result in those being assessed feeling outside of the process or left to feel they must disprove the practitioner's interpretation or opinion. From an anti-oppressive and empowering perspective, Adams et al. (2009), in their reflections on social work in a complex world, explain

that social workers should not consider their employing agency and the social care process is non-oppressive to the people they work with.

Notwithstanding, often exemplary, practice efforts by many social workers, many children involved in children's services comment they have poor relationships with their social workers and that they are sceptical about the review process in presenting their views (Diaz et al., 2018). Children are too infrequently involved in decisions made about them, decisions which tend to be based on the practitioner's interpretation rather than the child or family's (Hackett & Taylor, 2014; Roose et al., 2009), interpretations that can vary between practitioners. It seems, assessing practitioners represent the views of children and vulnerable adults only when they correlate with the assessor's perceptions, opinions, and recommendations. The resulting systemic relations between social worker as assessor and child/ family as assessed is little understood and certainly under theorised. In this arena it is all too easy to take a decisive view which results in conflict between assessor and assessed and to blame the practitioner as risk averse or under-skilled. This blaming process is supported by the defensive reaction of the assessed (Rosenberg, 2015), whose predisposition to fear the possible consequences of the assessment is exacerbated by the assessor's apparent preoccupation with the risk and safeguarding discourse and possible focus on information which supports this perspective. Applying fuzzy logic, in that nothing is ever wholly true due to partial truths, and fuzzy concepts to theory allows for the recognition of diverse and alternative explanations to phenomenon based on perspective. Social workers may theoretically seek to work collaboratively with people to co-produce assessments that are anti-oppressive, though in reality families may feel concern at a system they perceive as over-focused on safeguarding which prohibits them seeking support from social workers (Heslop et al, 2019). The dichotomy between assessed and assessor appears to be beyond human agency when reports are consistent about the systematic reproduction of the divergence. However, social work and systems involving people, engagement and assessments cannot function outside of communication, at some form, between assessor and the assessed. The communication process, or how communication is enacted, constructed, and comprehended are key to understand social work practice.

Luhmann (1986; 1995) conceptualised autopoietic social systems through momentary elements whereby understanding in communication transactions is held by the listener rather than the speaker. The resonance with social work assessments is clear as the assessor holds the role of decision-making over the assessed. While not universally accepted, Luhmann's conceptualization of autopoietic social systems offers the theoretical possibility to examine, understand and explain the processes involved in the production and reproduction of social work assessments and to move beyond agency and the blaming of individuals (Mingers, 2002). Through the shift from a reproduction of relatively stable elements to a reproduction of momentary events Luhmann alters the concept of autopoiesis. The system is urged to constant production of new elements because the elements of the system are temporary and should the autopoiesis stop then the system disappears immediately. Luhmann considered communication, through the three elements of information, utterance and understanding, as the means for autopoietic social system reproduction. Luhmann argued that the third

communication element understanding is central to this process and meaning and therefore communication is ultimately determined through the listener's understanding. By applying Luhmann's autopoietic social systems model, the phenomenon of social work assessment appears as temporary sub-systems, involving assessor and assessed, whereby communication is constructed by the assessor who seeks to understand the assessed person's information and utterances but through a lens that is ultimately based on a risk and safeguarding discourse. The paradigm is the social worker during the assessment, through autopoietic reproduction, understands, regardless of the assessed person's utterance or meaning (their narrative), risk and safeguarding as primary issues. This process drives the ongoing present and future work with the child and family.

Shifting the Paradigm: Reflections on Communication and Mindsight.

To address the issues identified through autopoietic systems theory we suggest a change in perspective of assessment to:

1. focus on learning about the person being assessed, their narrative, rather than evaluation (based on a safeguarding discourse).
2. create safe spaces for assessor and assessed person to explore together and co-produce the work.
3. embed non-violent communication in connecting to self and others.

Assessment often will lead to a defence reaction and closing down in those assessed (Rosenberg, 2015). This reaction negatively impacts the wellbeing of all involved, including the assessors. Humans are embodied beings and communication and relations with others has a direct impact on the nervous system, and indeed on the immune system (Rauch, 2020; Rauch et al., 2019). Vast amount of research is available to suggest that the positivity/negativity perceived in everyday interactions impact on health as well as relationship and communication with others (Maturana & Verden-Zöllner, 2008; Rosenberg, 2015; Sice et al., 2018; Stowell, 2020; Varela et al., 2016). A context of play and learning: 'We are here to learn together about your experience and support you in your wellbeing and your aspirations' is very different from a context of evaluation and assessment. The context of learning and support will focus on exploring about the person's narratives, perspectives, strengths, assets and needs as well as adversities. Research in neuroscience, autopoiesis (Maturana & Varela, 2012), polyvagal theory (Porges, 2009), psychology (Levine, 2010; Siegel, 2010), suggests that curiosity and learning are only possible within safe spaces, i.e., spaces where we feel safe to trust and connect with ourselves and others (Figure 1).

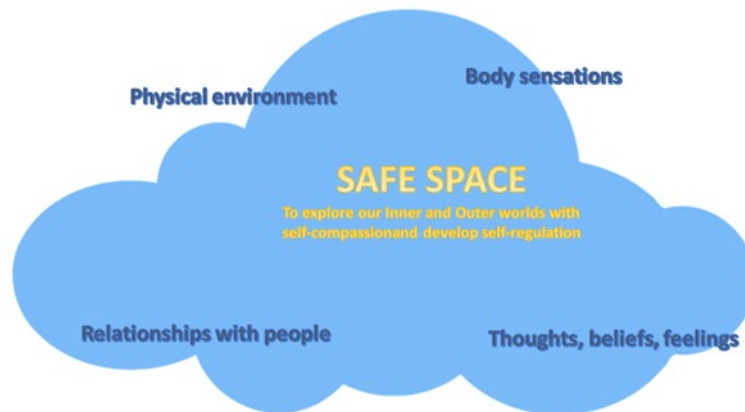


Figure 1. Safe Spaces to promote self-regulation

By processing information from the environment through the senses and the nervous system we continually evaluate risk. Porges (2009) coined the term ‘neuroception’ to describe how neural circuits distinguish whether situations are safe or dangerous. His polyvagal theory proposes a neurophysiological model of safety (Porges, 2009). The model emphasises, safety is defined by feeling safe and not by the removal of threat. Feeling safe is dependent on the state of the autonomic nervous system and on detection of cues of safety in the environment, via neuroception. This safe space can be a challenge for the practitioner who feels threatened by the concern of missing risk, vulnerability and safeguarding and for the child or their family by the imminent concern over the possible consequences of an adverse assessment.

Neuroception takes place in primitive parts of the brain, without conscious awareness (Porges, 2009). It is a bodily feeling. It can be brought to cognitive awareness through a balanced focus on the present moment information from the senses and body sensations. Rothschild (2011) argues that balancing attention focus between the senses and bodily sensations allows for regulating ways of feeling in the present moment. Siegel (2010) proposes a ‘wheel of awareness’ practice to include awareness of thoughts, feelings, images and connectedness to others, as a way of integrating awareness and promoting compassion to self and others, and thus promoting self-regulation (Ogwu et al., 2020; Rothschild, 2011; Sice et al., 2018; Siegel, 2010). Figure 1 points to this important aspect of safe spaces, the balanced awareness of both inner and outer environments. Our awareness of and our particular way of being and engaging in our environment brings forth a world. Any perturbation in our internal or external environment is perceived through our human biological and psychological embodiment in the context of the situation we are in, and this impacts what we ‘see’ and ‘interpret’ and how we communicate (Maturana & Varela, 2012; Varela et al., 2016).

Rosenberg (2015) developed a specific non-violent approach to communication—speaking and listening—that leads to give from the heart, connect with ourselves and with each other in a way that allows natural compassion to flourish. While a detailed reflection on the approach is not within the scope of this article, it is important to emphasise the objective of the non-violent communication process. i.e. to develop honest, empathic relationship with ourselves and the

others is an essential element of the safe space concept. This perspective is echoed in Maturana and Varela's work in autopoiesis (Maturana & Varela, 1992), emphasising the importance of respecting others as a source of richness, not as a source for judgement and thus oppression. Communication processes that nurture human flourishing of those involved require ongoing social learning. Enforced static mechanism of assessment and evaluation, constitute impaired human systems, that have depersonalized their members (Maturana and Varela, 1992). Bowlby (1997) identified how people develop different attachment styles depending on early experiences of care: either secure or insecure, in its basic interpretation. These early experiences shape the Internal Working Model; whether we learn that we are good or bad, loveable or unlovable, competent or helpless, that caregivers are responsive or unresponsive, trustworthy or untrustworthy, caring or hurtful and whether the world is safe or unsafe, life is worth living or not worth living. How we perceive the world, ourselves, and even how we feel in our body, is affected by our early experiences of a child-parent relationship. These perceptions can often be held unconsciously, for example in our autonomic nervous system. Dana (2018) used the metaphor of a ladder to represent this; at the top of the ladder, there is a sense of security, safety with an ability to be social and engaged. The security drops as we move down the ladder, the middle rung represents feeling unsafe, overwhelmed, and acting in a dis-organised way and at the bottom of the ladder we feel numb, collapsed, shut down and avoidant.

Given the prominence of attachment theory in social work, it is a surprise Siegal's Mindsight (2010), which is the capacity to clarify, label and analyse the internal emotional world and its response to the external world, has gained little attention in social work. The potential for Mindsight's application in social work is enhanced by narratives, storytelling and life story therapy with children and vulnerable adults (Moore, 2019). Siegal (2010) views the brain as having two different parts, a thinking part and a survival part. If we look at this in terms of polyvagal theory we can see how at the top of the ladder, we are in our thinking brain, in the middle of the ladder, we are in the survival part of our brain operating in fight or flight. At the bottom of the ladder, we are in a freeze survival mode. Siegal's concept of Mindsight offers a way of keeping at the top of our ladder and moving towards more secure attachment styles. Siegal suggests that by noticing and naming we can tame feelings, calm our nervous system, keep in or return to our thinking brain. Awareness is seen as a tool for transformation: moving from unconscious to conscious thought, which is a pre-requisite for change. Narrative theory (White & Epston, 1990) also supports the concept of transformation. Denborough (2014) suggests that the stories we hold about ourselves shape our lives, and those who have experienced adverse childhood experiences may hold negative stories that have been created by themselves or others and confirmed by others or themselves which can lead to negative outcomes in life. Theories of child development such as Piaget and Vygotsky highlight that generally, a child under eight views the world as revolving around themselves, so when a child is abused the only story that may make sense to them at the time may be one of being bad and unlovable. Denborough (2014) highlights how a story of tragedy, often authored or influenced by other people or wider factors such as poverty, racism, sexism, or violence, can preclude triumph. While we may not be able to change the stories others hold about us, changing the stories we tell about ourselves can be transformative and healing.

Where people hold one narrative line, or a one-sided view, what White and Epston (1990) call a 'thin' story, they can benefit from interventions which provide opportunities for developing a richer, more multi-layered story containing a sense of greater possibilities in their life. Rose (2012) presents a model of Therapeutic Life Story Work which provides an opportunity for the person to understand and tell their story; work towards recovery from trauma, improve how they see themselves and generate more positive possibilities for their future. Golding (2014) identifies storytelling as a valuable tool for helping children and adults learn about their feelings, their inner world of hopes and dreams; providing an experience of feeling understood and not alone in how they feel. Through focusing on narratives and story-telling the assessment becomes a more enlivened experience and a more robust mechanism to support children and vulnerable adults and their families. Stories can impact on how children think and understand relationships, how they understand and see themselves. All children can benefit and grow through stories, they provide a way of talking about inner experience and learning from the experience of others. Similarly, Siegel and Bryson (2012) suggest that in making sense of our childhood experiences by creating a coherent narrative we can 'rewire' our brain, understanding our story can heal the deep wounds, behaviours, and beliefs about ourselves that we carry from our earliest attachments that unconsciously direct our lives.

The concern is that assessments and communication in social work can be listener led and unconsciously biased. This article has theorised on the practice process and conjectured it can, inadvertently, be practitioner-based. No one intends for this to happen and in both assessments and on-going direct work the process has to be reframed towards the service recipient, the child, the vulnerable adult and their families. Concepts such as appreciative inquiry suggest that systems change in the direction in which they inquire, an appreciative approach aims to discover what gives life to a system, what energises people and what they most care about, to produce both shared knowledge and motivation for action. Such strengths-based approaches focus on what worked or is working well and elicit different information than a focus on what may be wrong and not working, crucial elements of a holistic assessment.

Moving Forward: Connecting Spaces

Identifying a problem, and recognising theoretical solutions is conjecture, the more problematic aspect is evoking change. This article introduced conversations between three distinct professionals and highlighted shared understandings. The next steps are to design a conceptual tool - Connecting Spaces - currently in development, that can be used to support richer, more therapeutic and child led assessments and interventions. Through this tool the aim is for the child or vulnerable person to create a representation of, or narrative about, their life in the past, present and/or imagined future. The aim is to inform and improve decision making by enabling the assessed person's utterances and meaning to be understood from their perspective and undo the reproductive autopoietic social system based on the listener's understanding. This tool will enable the views, wishes and feelings to be explored, heard, presented, evidenced, and considered and provide the potential to present and consider multi-perspectives and narratives to focus on individual agency, adaptive capacity, and the production of robust and defensible

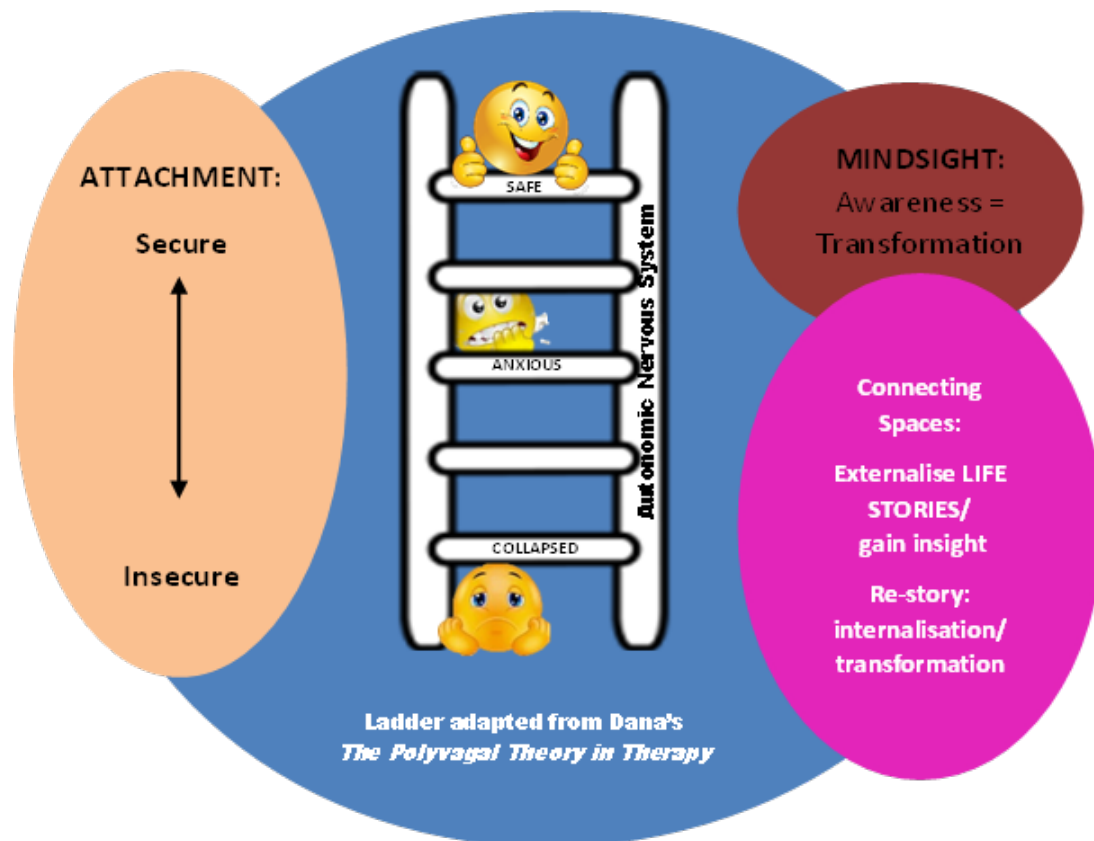


Figure 2. How Attachment, Polyvagal Theory and Mindsight inform Connecting Spaces

practice. This flexible communication tool is being designed to have a range of uses and will be provided in both digital and 3D physical form to suit a range of needs. The aim of the format is to incorporate the powerful language of play to create a visual picture of the person's view that can be explored, re-storied and shared with others, while appealing to a wide age range. The worker and/ or parent/carer will seek to enter the child or vulnerable person's world, seeing the situation, experience, and associated emotions from their view. Connected Spaces has the potential to inform and enrich assessment, as well as uses in therapeutic work such as Therapeutic Life Story Work, to co-create a transformative meaning. The aim is to increase communication, awareness, insight, and shared understanding. This type of approach has the potential to produce a deeper more meaningful understanding of the child or vulnerable person's internal and external world, explore their relationships and connections with others, explore various hypothetical scenarios, and gain awareness of possibilities. Play can often communicate so much more than conversation, especially where vocabulary may be restricted or undeveloped. This conceptual tool does not aim to replace but to enhance building relationship, safety, and communication in direct work with a child or vulnerable adult. The person is invited to use Connecting Spaces to create a narrative about their lives, past, present and/or future. The aim is to inform and improve decision making by providing a vehicle for the child or vulnerable adult to explore and express their views, wishes and feelings.

Conclusion and Next Step

This article reflects the conversations between three distinct professionals and has conjectured that assessment and communication in social work can, inadvertently, be listener led and unconsciously biased. We consider reframing towards the service recipient, the child, the vulnerable adult and their families by creating a safe space, and seek to identify a strengths-based approach to improve communication and inform decision making by enabling multiple perspectives and narratives. We suggest a focus on individual agency, adaptive capacity to produce robust and defensible practice to undo the reproductive autopoietic social system based on the listener's understanding. Awareness is seen as a tool for transformation: moving from unconscious to conscious thought, which is a pre-requisite for change. Through focusing on narratives and story-telling the assessment becomes a more enlivened experience and a more robust mechanism to support children and vulnerable adults and their families.

Our hypothesis is that Connected Spaces has the potential to inform and enrich assessment, direct social work practice as well as uses in therapeutic work such as Therapeutic Life Story Work. The purpose of this article is to present ideas now for publication, wider exposure, and potential contribution from other systems thinkers. The next step is to trial the conceptual tool, which will be the focus of another article.

References

- Adams, R., Dominelli, L., & Payne, M. (2009). *Practicing Social Work in a Complex World*. Palgrave MacMillan.
- Baginsky, M., Manthorpe, J., & Moriarty, J. (2020). The Framework for the Assessment of Children in Need and Their Families and Signs of Safety: Competing or Complementary Frameworks? *British Journal of Social Work*, 00, 1–19. DOI: <https://doi.org/10.1093/bjsw/bcaa058>.
- Beckett, J. (2018). The Changing Nature of Social Work. *International Social Work*, 61(6), 968-973. DOI: <https://doi.org/10.1177/0020872817695645>.
- Bowlby, J. (1997). *Attachment and Loss. Vol. 1, Attachment* (2nd ed.). Pimlico.
- Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Harvard University Press.
- Dana, D. (2018). *The Polyvagal Theory in Therapy: Engaging the Rhythm of Regulation*. W W Norton & Co.
- Denborough, D. (2014). *Re-telling the Stories of our Lives: Everyday Narrative Therapy to Draw Inspiration and Transform Experience*. W. W. Norton & Co.
- Department for Education. (2018). *Working Together to Safeguard Children*. Department for Education. Retrieved 14/7/21 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729914/Working_Together_to_Safeguard_Children-2018.pdf

Department for Education. (2020a). *Longitudinal Study of Local Authority Social Workers*. Department for Education. Retrieved 14/7/21 from <https://www.gov.uk/government/publications/longitudinal-study-of-local-authority-social-workers>.

Department for Education. (2020b). *Reporting Year 2020: Characteristics of children in need*. Retrieved 14/7/21 from <https://explore-education-statistics.service.gov.uk/find-statistics/characteristics-of-children-in-need/2020>.

Department for Education. (2020c). *Reporting Year 2020: Children looked after in England including adoptions*. Retrieved 14/7/21 from <https://explore-education-statistics.service.gov.uk/find-statistics/children-looked-after-in-england-including-adoptions/2020>.

Diaz, C., Pert, H., & Thomas, N. (2018). 'Just Another Person in the Room': Young People's Views on their Participation in Child in Care Reviews. *Adoption & Fostering*, 42(4), 369-382. DOI: <https://doi.org/10.1177/0308575918801663>.

Dominelli, L. (2002). *Anti-oppressive Social Work Theory and Practice*. Palgrave Macmillan.

Garrett, P. (2018). *Social Work and Social Theory: Making Connections (2nd Edn)*. Polity Press.

Golding, K. (2014). *Using Stories to Build Bridges with Traumatized Children: Creative Ideas for Therapy, Life Story Work, Direct Work and Parenting*. Jessica Kingsley Publishers.

Green, L., & Featherstone, B. (2014). Judith Butler, Power and Social Work. In C. Cocker & T. Hafford-Letchfield (Eds.), *Rethinking Anti-discriminatory and Anti-oppressive Theories for Social Work*. Palgrave MacMillan.

Hackett, S., & Taylor, A. (2014). Decision Making in Social Work with Children and Families: The Use of Experiential and Analytical Cognitive Processes. *The British Journal of Social Work*, 44(8), 2182-2199. DOI: <https://doi.org/10.1093/bjsw/bct071>.

Healy, L. (2014). *Social Work Theories in Context: Creating Frameworks for Practice*. Macmillan.

Heslop, P., McAnelly, S., Wilcockson, J., Newbold, Y., Avantaggiato-Quinn, M., & Meredith, C. (2019). Do parents and carers experiencing violent and challenging behaviour from their children fit with safeguarding models of support? Messages from a Facebook study. *The Journal of Adult Protection*, 21, 285-295. DOI: <https://doi.org/10.1108/JAP-06-2019-0018>.

Heslop, P., & Meredith, C. (2019). *Social Work: From Assessment to Intervention*. Sage.

Kahneman, D. (2011). *Thinking, Fast and Slow*. Penguin.

Klein, G. (1998). *Sources of Power: How People Make Decisions*. MIT Press.

Klein, G. (2004). *The Power of Intuition*. Doubleday.

Levine, P. (2010). *In an Unspoken Voice: How the Body Releases Trauma and Restores Goodness*. North Atlantic Books.

Luhmann, N. (1986). The autopoiesis of social systems. In F. Geyer & v. d. Zouwen (Eds.), *Sociocybernetic Paradoxes*. J. Sage.

Luhmann, N. (1995). *Social Systems*. Stanford University Press.

Maturana, H. R., & Varela, F. J. (1992). *The Tree of Knowledge: The Biological Roots of Human Understanding*. Shambhala.

Maturana, H. R., & Varela, F. J. (2012). *Autopoiesis and Cognition: The Realization of the Living* (Vol. 42). Reidel Publishing Company.

Maturana, H. R., & Verden-Zöllner, G. (2008). *The Origin of Humanness in the Biology of Love*. Imprint Academic.

McGinnis, E. (2013). Task-centred work. In T. Lindsay (Ed.), *Social Work Intervention (2nd Edn)* (pp. 35-51). Sage.

Mingers, J. (2002). Can Social Systems Be Autopoietic? Assessing Luhmann's Social Theory. *The Sociological Review*, 50(2), 278-299. DOI: <https://doi.org/10.1111/1467-954X.00367>.

Moore, J. E. (2019, 2019/05/04). 'The Storying Spiral': a narrative-dramatic approach to life story therapy with adoptive/foster families and traumatised children. *International Journal of Play*, 8(2), 204-218. DOI: <https://doi.org/10.1080/21594937.2019.1643994>.

Munro, E. (2011). *The Munro Review of Child Protection: Final Report A child-centred system*. Department for Education.

Munro, E., Cartwright, N., Hardie, J., & Montuschi, E. (2017). *Improving Child Safety: Deliberation, Judgement and Empirical Research*. Centre for Humanities Engaging Science and Society. Retrieved 14/7/21 from <https://dro.dur.ac.uk/22298/>

Ogwu, S., Sice, P., Keogh, S., & Goodlet, C. (2020). An exploratory study of the application of mindsight in email communication *Heliyon*, 6(7), e04305. DOI: <https://doi.org/10.1016/j.heliyon.2020.e04305>.

Oko, J. (2011). *Understanding and Using Theory in Social Work (2nd Edn)*. Learning Matters.

Platt, D., & Riches, K. (2016). Assessing Parental Capacity to Change: The Missing Jigsaw Piece in the Assessment of a Child's Welfare? *Children and Youth Services Review*, 61, 141-148. DOI: <https://doi.org/10.1016/j.childyouth.2015.12.009>

Porges, S. W. (2009, Apr). The polyvagal theory: new insights into adaptive reactions of the autonomic nervous system. *Cleve Clin J Med*, 76 Suppl 2(Suppl 2), S86-90. DOI: <https://doi.org/10.3949/ccjm.76.s2.17>.

Rauch, H. L. (2020). *Keeping Calm: How to Master your Brain Reward System to Optimise your Health, Wellbeing and Performance*. Kindle Edition.

- Rauch, H. L., Sice, P., Bentley, E., & Uhomoibhi, J. (2019). Autopoietic Management of Behaviour, Reflection, Awareness and Innovation in a circular economy. *Systemist*, 41(1), 117-132.
- Reid, W. (1997). Research on Task-centered Practice. *Social Work Research*, 21(3), 132-137. DOI: <https://doi.org/10.1093/swr/21.3.132>.
- Roose, R., Mottart, A., Dejonckheere, N., Van Nijnatten, C., & De Bie, M. (2009). Participatory Social Work and Report Writing. *Child & Family Social Work*, 14(3), 322-330. DOI: <https://doi.org/10.1111/j.1365-2206.2008.00599.x>.
- Rose, R. (2012). *Life Story Therapy with Traumatized Children: A Model for Practice*. Jessica Kingsley Publications.
- Rosenberg, M. (2015). *Non-violent Communication: A Language of Life (3rd Edn)*. Puddle Dancer Press.
- Rothschild, B. (2011). *Trauma Essentials: The Go-to Guide (Go-to Guides for Mental Health)*. WW Norton & Co.
- Ruch, G., Turney, D., & Ward, A. (2010). *Relationship-based Social Work: Getting to the Heart of Practice*. Jessica Kingsley.
- Sice, P., Bentley, E., & Rauch, L. H. (2018). Ontology, epistemology and the complexity of human neurobiology. *Human Systems Management*, 37(3), 353-360. DOI: 10.3233/HSM-171795.
- Siegel, D. (2010). *Mindsight: The New Science of Personal Transformation*. Bantam.
- Siegel, D., & Bryson, T. (2012). *The Whole-Brain Child; 12 Proven Strategies to Nurture your Child's Developing Mind*. Robinson.
- Stevens, M., Woolham, J., Manthorpe, J., Aspinall, F., Hussein, S., Baxter, K., Samsi, K., & Ismail, M. (2018). Implementing Safeguarding and Personalisation in Social Work: Findings from Practice. *Journal of Social Work*, 18(1), 3-22. DOI: <https://doi.org/10.1177/1468017316652001>.
- Stowell, F. (2020). Part two: the challenges of a soft systems inquiry. Integrating Husserl and Gadamer. *Kybernetes*, 50(5), 1553-1156. DOI: <https://doi.org/10.1108/K-05-2020-0281>.
- The Independent Review of Children's Services. (2021). *Case for Change*. Retrieved 14/7/21 from <https://childrensocialcare.independent-review.uk/case-for-change/#>
- Thomas, J., & Holland, S. (2009). Representing Children's Identities in Core Assessments. *The British Journal of Social Work*, 40(8), 2617-2633. DOI: <https://doi.org/10.1093/bjsw/bcp154>.
- Turnell, A. (2012). *The Signs of Safety: Comprehensive Briefing Paper*. Australia: Resolutions Consultancy Pty Ltd.
- Varela, F. J., Thompson, E., & Rosch, E. (2016). *The Embodied Mind: Cognitive Science and Human Experience*. MIT press.

Systemist, Vol. 42 (1), September 2021

White, M., & Epston, D. (1990). *Narrative Means to Therapeutic Ends*. W. W. Norton & Co.

ONLINE ACTION RESEARCH IN THE TIME OF COVID

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Abstract

Between 2020 and 2021 severe restrictions were placed upon travel and movement within the UK because of the Covid-19 pandemic. New rules governing the composition of meetings meant that researchers who had planned to employ Action Research had to rethink their strategies. The planned field research, a fundamental part of this inquiry, had to be reassessed to take into account the restrictions on individual and group meetings. These changes affected how the researchers could set about the inquiry and led to the exploration of technology-based communication systems as the means of undertaking the field research. In this paper we recount the technologies that were considered prior to the field study, and the experiences and lessons learnt from a pilot study in which these technologies were used with a soft method of inquiry. This was a new experience for all concerned and a thorough thought process had to be put in place, but one that provided valuable guidance on how to undertake a field study with a degree of confidence where face-to-face contact is not possible.

Key Words: Action Research; AIM, Soft Systems; Information and Communications Technology, Covid-19 restrictions, collaborative software

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Introduction

The main field research was set up to learn about the mix and range of factors that affect the local community's food access and provision as part of an inquiry into the notion of 'food deserts'. Food deserts are known as populated areas with no or limited fresh food access; or as 'populated urban areas with no access to healthy and affordable food for residents' (Beaumont, Lang, Leather and Mucklow, 1995 cited in Lu and Qiu, 2015; Cummins & Macintyre, 2002; Wrigley, 2002). Its first reference was in a government publication for the then governments Nutrition Task Force (Beaumont et al., 1995, cited in Cummins and Macintyre 2002, p. 436), as an outcome of a policy working group called Low Income Project Team in 1995. (ibid; Wrigley 2002).

Simply stated, the research was designed to explore different stakeholder perspectives on the nature and consequences of unequal access and provision of fresh fruit and vegetables to the Portsmouth community. The chosen method of research was action research and the method of inquiry was the Appreciative Inquiry Method (AIM) (Stowell 2012). The Covid-19 restrictions on meetings prevented face-to-face contact meaning that the field research would have to be redesigned. An alternative way of using AIM had to be developed and tested before the main field study could be undertaken. The restrictions created a dilemma for the researchers because the time budgeted for this essential section of the research still had to be maintained. Doubtless similar pressures have been experienced for all forms of research over the past year and lessons learnt in this study could be valuable for other similar research.

The purpose of this paper

The purpose of this paper is to describe the investigation made into the possible use of Information and Communications Technology (ICT) to support an action research field study. The decision to use ICT was made because of the restrictions prohibiting personal contact during the Covid-19 pandemic. In this paper we report on the way in which this alternative approach to action research took shape and how some ICT platforms were tested for their suitability for use for soft action research. The lessons learnt would help to prepare for the main field research and might also provide some valuable practical lessons and insights for carrying out action research entirely online. In the following sections we will discuss some of the insights and reflect upon their potential benefit for the main field study.

Action Research – The Lancaster model

The decision was made to capitalize upon the vast experience, gained over several decades of organisational inquiry, from the Lancaster University's 30-year programme of research (see Checkland 1999). This kind of field research, let us call it soft action research, involves the inquirer to engage directly with those involved. That is to say they seek to gain first-hand experience from within the area of concern and create a virtuous cycle of learning (see Checkland, 1999, p. A4). This approach is based upon Susman and Evered's notion of action research where "...*Knowledge is gained dialectically by proceeding from the whole to its parts and then back again*" (Susman and Evered, 1978, p.595), *Figure 1* below.

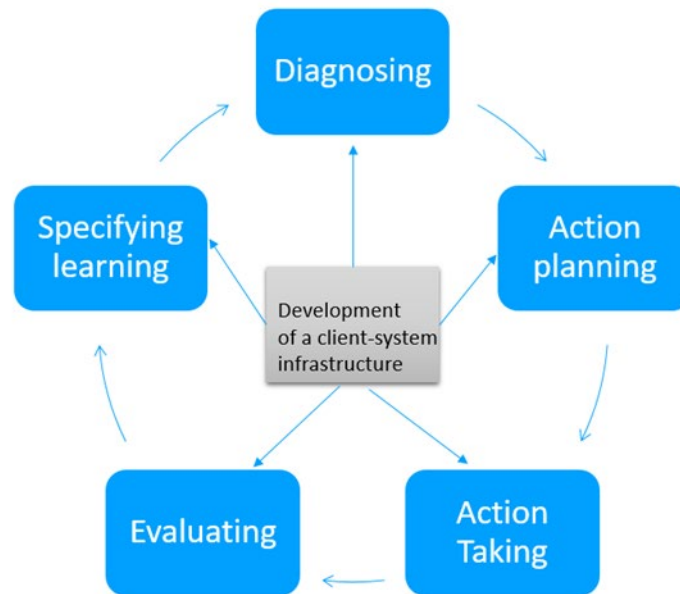


Figure 1 - Action Research Cycle of Learning, adapted from Susman and Evered (1978, p.588)

Covid regulations prohibited face-to-face contact but nevertheless, based on the findings from a previous exploratory field research into the driving factors of urban ‘food deserts’, the researchers decided that the research would be richer if experiences and opinions could be obtained from within the local community. The restrictions in personal contact created practical difficulties that could not easily be solved within the restricted time scales of the project. This was particularly the case for using soft methods of enquiry. Although the original intention was to use Soft Systems Methodology (SSM) for the field study, the restrictions would make this a difficult undertaking. Whilst SSM is a powerful means of inquiring into ‘complex’ and ‘messy’ situations and “...provides the process for bringing about change, AIM is intended solely as a means of finding out what is considered to be the case in a given situation” (West, 1995, p.144). The earlier exploratory field research had already suggested issues that could be addressed, which is the starting point for the AIM (see Stowell 2021).

AIM was considered appropriate and to be adopted. The next challenge for the researchers was whether AIM could be supported by technology?

Applying the Method

Paradoxically, the Covid-19 restrictions provided the researchers with an opportunity to explore new ways of undertaking action research using ICT. It also held the promise that in undertaking action research in this way, it might surface lessons that could be valuable to other action researchers.

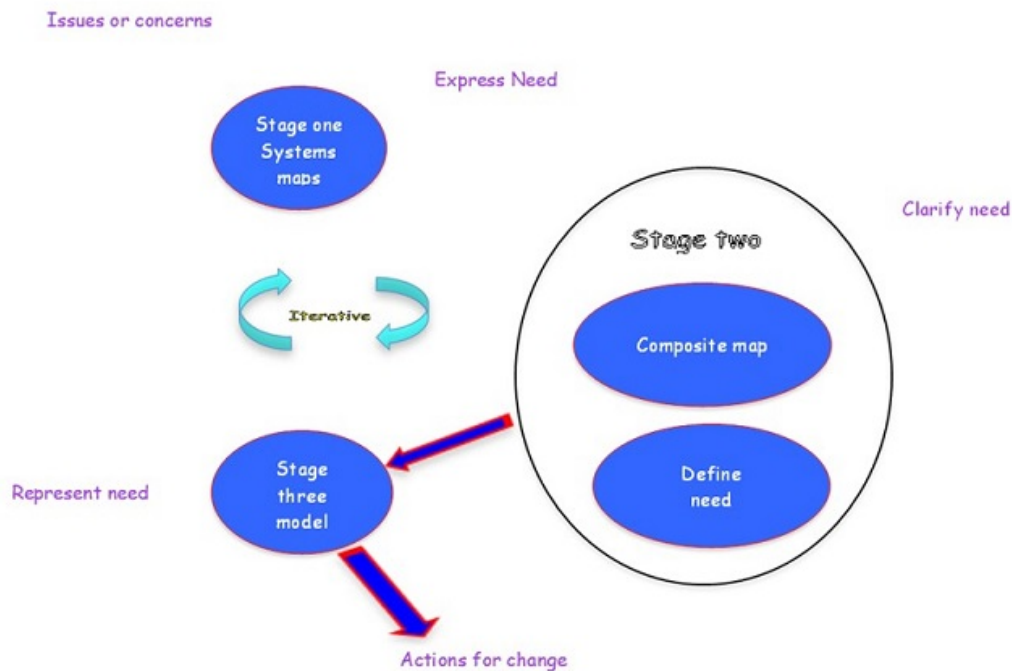


Figure 2 – Appreciative Inquiry Method (AIM) diagram with stages, (Stowell, 2021)

A schematic of AIM is shown in *Figure 2*. It should be noted that the lessons learnt from the pilot study refer to phases which can be assumed to be the stages indicated in the diagram.

The use of ICTs suggested a way forward which would enable a form of contact without transgressing the Covid rules in force at the time. This meant rethinking the way in which the method could be applied. Different platforms were explored to find one that could provide virtual contact but supported and maintained the key elements of AIM. The lessons learnt from the pilot study and the influence it had upon AIM would be valuable in the main field study. The pilot study is discussed below.

Setting up the pilot study

Selection of participants

The pilot study was conducted with a small group of PhD students from the University of Portsmouth. Our purpose was to test the ICT platforms and learn about its adaptation for use in action research, in particular its use with AIM. The pilot study was to explore the experiences of using the approach within the Post-Graduate Research Students (PGRS) at the Faculty of Business and Law. The question we asked the participants to consider was: *'How can research environment and culture for PGRS at UoP be improved?'*

We used purposive sampling to recruit participants for the pilot study, representing the diverse group of PhD students from the Faculty. We attempted to get a limited but representative

sample of identified key criteria and experience to discuss research culture and environment. The criteria considered included the following:

- Full time and part-time PhD students;
- On/off campus PhD students;
- PhD students from four out of seven different subject groups from the Faculty of Business and Law,
- PhDs at different stages of their PhD journey;
- At least one participant in position of a student representative role.

N.B. This study provided some interesting insights into the way that this group viewed the research culture in the school² but the outcomes are not entirely germane to the research reported here. For this report we will confine it to the suitability of various ICT's for action research.

Investigation of ICT platforms

The platform had to satisfy four basic needs:

- the needs of the facilitator to support the requirements of the method employed;
- serve the needs and convenience of a diverse stakeholder group with different levels of technical skills;
- serve the needs of the group as a whole within a dynamic setting to simulate the experience of face-to-face interaction;
- the chosen platform should be user-friendly, available and easy to use.

These requirements made it necessary to evaluate several platforms and carry out tests before involving any participants in a pilot study. It should be noted that what might seem to be the best choice from a technical perspective does not always gain acceptance in the real world. This is especially the case if the participants are unfamiliar with the software or find it difficult to operate (e.g. not user-friendly interface or intuitive platform).

There exists a number of online platforms with various features that might be suitable for our research. However, we were unaware of any papers about ICT platforms used in action research. Stowell and Cooray (2017a) had explored the use of ICT (using Wiggio, which is no longer available) in an earlier study in remote group settings, but this was before the limiting factors of face-to-face meetings in force in the UK at the time of this study. During Covid-19 pandemic the use and demand of ICT platforms for education, work, and leisure rapidly increased because of the Covid restrictions leading to increased numbers working from home. The increased use impacted on the availability of ICTs. During the testing period, the high demand resulted in some limitations on certain features on some of the platforms. For example,

² A summary of this exercise can be found in the internal publication of the outcomes of Operations and Systems Management. See internal record of the pilot study.

interface or a full range of features varied from trial versions to fully licensed ones. Consequently, this affected the selection and availability of the most suitable ICT platform for the research.

Video-conferencing platforms that were considered ranged from commonly known and freely accessible ones (e.g. Skype, WebEx, Microsoft Teams, Google Meet, Zoom), to online collaboration tools or noticeboard platforms (e.g. SamePage, Conceptboard, Google Groups, Padlet). It must be noted that there was a limitation of platforms that were available and provided via the University of Portsmouth to the facilitators, which influenced the testing period³. Some platforms were eliminated because these platforms were lacking particular features that could accommodate AIM. The majority of platforms explored were meant for team collaboration for professionals' and practitioners' purposes (e.g., on a shared document, database etc.), which ruled them out for this research where human interaction, body language coupled with verbal communication can be meaningful. There was also a mismatch of features and usage in practice. It was found that collaboration platforms with visual interface and tools were not synchronized with videoconferencing in real time with instant changes (some platforms had time lags), or they did not have the option. A combination of platform and online collaboration tools or noticeboard platforms were tested, but none were found to be satisfactory for the facilitators or participants.

Testing Platforms against research requirements

As mentioned above several platforms were tested that included video-conferencing platforms and online collaboration platforms all considered capable of 'capturing' expert opinions. The selection of ICT platforms was scoped down to the following: Google Meet (GM), Blackboard Collaborate (BC); and later Zoom and Padlet. The choice of platform had to be able to accommodate online individual and group discussion and enable the creation of Venn diagrams in real time and on one screen. Of the available platforms tested at that time there was no single candidate that would satisfy all these requirements⁴.

Eventually a compromise had to be reached. The criterion was now to find an online platform that would work best for the facilitators as well as for the participants bearing in mind that not all participants would be experienced or possess the technical skills to learn and operate the chosen software. The choice was to find a platform that was simple yet sophisticated enough to allow the researcher to collect all necessary 'expertise' without using more than one ICT platform.

Initially Blackboard Collaborate (BC) was selected because the tests showed it outweighed all the other platforms and fulfilled most of the requirements. The trial version was advanced (e.g., wide array of rooms and purposes from research, lecturing to collaboration use), but it was also

³ Whilst the aforementioned platforms were freely available, ICT platforms requiring the purchase of a license were explored based on the word-of-mouth and use in academia and research. Blackboard Collaborate (BC) was one of those considered in this testing period, but it was not freely available to the facilitators and hence why only a trial and licensed version was tested.

⁴Zoom and Padlet were used once access was granted by the University of Portsmouth to the facilitators.

limited on several key aspects (e.g. inability to invite attendees via generating a link, required registration and sign in). The license version was more time-efficient and practical. It also saved the participants' time by avoiding any additional work/registration required. Unfortunately, when using the licensed version, it was found to be limited with reduced features. Some of its functions were different from the one tested (e.g., ability to switch between shared files and whiteboard without losing data) and switching between contents (e.g., shared screen and whiteboard with created annotations) resulted in a loss of data, in contrast to the trial version.

Further tests were made in order to establish the platforms capability to facilitate online meetings and accommodate the participants' feedback. We found that GM provided a stable performance and because its interface is similar to Microsoft Office it increased the confidence of the participants. A decision was made to base the pilot study around GM because it was simple to use and generated a user-friendly environment.

We also evaluated Padlet, an online noticeboard platform for synchronous (run in real time) and asynchronous sessions (reflection within extended time period) which proved itself to be a useful tool for authentication of participants' opinions. Padlet was consequently added to the 'tool kit' as a mid-step between phase 2 and phase 3.

From learning and feedback gained from phases 1 and 2 and from Padlet, modifications and more tests were made to facilitate further online meetings. Whilst there were overall outweighing benefits to use GM as an online platform in AIM study, there were some downsides that showed in the pilot study's online group meeting and not during testing. For instance, the inability to see all participants while sharing the content meant that it was not possible to make sense of 'silences' or to witness the effects of body language on other participants. Only assumptions could be formed. The importance of an online platform and its role and impact on the discussion in an online environment is therefore emphasised here. At this point of research, Zoom licensed access was granted to the researchers by the University, and further testing could take place. In this case the researchers decided that Zoom would be explored and tested further as a potential substitute for face-to-face meetings, since both BC and GM were not entirely satisfactory for the selection of platform.

The outcome of the testing of platforms was the decision to use Zoom and Padlet as they seemed to offer the best alternative to the face-to-face environment needed for the main field study. Zoom was used for all synchronous meetings, while Padlet was used for asynchronous feedback in between phases for authentication.

Practical insights and lessons learnt from the pilot study

The pilot study was conducted in three main phases as follows

- Phase 1 (AIM Stage 1) – Individual systems maps
- Phase 2 (AIM Stage 2) – Individual encounters for composite map

- Mid-step for asynchronous online collaboration to prepare authenticated materials (composite map and definitions) for phase 3
- Phase 3 (AIM Stage 3) – Online group meeting to develop activity models

Besides the importance of an online platform that was emphasised above, the pilot study provided other valuable lessons and insight into the application of AIM entirely online. These are discussed below.

Lesson 1: The importance of boundary

The notion of boundary is fundamental to any study and particularly so for soft A/R (see Stowell and Welch, 2012, pp.4-7; Checkland, 1999, p.174; Ulrich, 1994, p.244). It is essential to note that its importance is not diluted because the participants are not physically present. Because of the relative ease of recruiting participants (who can take part from the comfort of their home) the temptation to recruit a large number of participants just for the sake of it should be resisted.

The importance of boundary and its significance became clear as the pilot study progressed. By thinking about the scope of the study and its limitations will help to consider the kind of participants that might best help in the understanding of the situation of concern. For example, in hindsight it was clear that not all stakeholders⁵ were invited that could have added valuable insights and knowledge about the question posed.

The inclusion of boundary is also clearly identified within an AIM study, and this is equally important when carrying out a study in a virtual environment. We suggest that the boundary can be reviewed in the same way as for a face-to-face study, by employing the mnemonic PEARL. PEARL consists of 5 elements: P-participants; E-engagement; A-authority; r – relationships; L – Learning (for a full account see Stowell, 2021; Stowell and Cooray, 2017b; Champion and Stowell, 2003). We found PEARL invaluable in this inquiry particularly the PEA in PEARL, i.e., who is included who should have been included and who might have been better not to be included. It helps to think about the impact that the participants might have upon the findings both before and after the study. Establishing a boundary helps reduce the possibility of diversions to irrelevant areas/topics. For example, we noted that some participants tended to speak outside the pilot study's boundary bringing in their own issues and experiences and think about other 'systems' leading to loss of focus.

Lesson 2: Observation of individual vs. group dynamics in online sessions

Phases 1 and 2 were conducted with individuals and, importantly, with the minimum interference from the facilitator. In an online environment this is more complex than in the face-to-face situation involving soft methods where group interaction is important as a means of engaging participants. In the online application of AIM we found that discussions benefited

⁵ Faculty Research Degree Coordinator, Departmental Research Degree Coordinators for each Subject Group at the Faculty, supervisors' representative, student representatives from each Subject Group, Administration team for PGRS, Graduate School representative were considered for the pilot study. However, their involvement was infeasible because of the time restrictions. This has shown in the actual pilot study that input of these stakeholders mentioned above in terms of provision of support, services and facilities (amenities) according to mode of study are vital and should have been included.

if each participant was given the option of being anonymous. This proved valuable especially in the early phases of AIM. However, even in a virtual environment we noted that dealing with non-homogenous groups still has the potential of influence and dominance of certain groups.

It is important to note that allowing discussions, especially in 1-2-1 sessions, can have a negative impact on time. Time became an issue in all encounters and went beyond suggestions in the literature regarding approximate length of meetings (the timings were derived from 'normal' face-to-face encounters). It was noted that online group dynamics were different from the individual 1-2-1 setting, and possibly from face-to-face meetings. Initially participants were reluctant to converse, and it took time for them to relax and begin to engage. The study then changed from being reactive, with the facilitator actively leading, to one where the participants began discussing the topic amongst themselves. It is also worth noting that the occasions when we were joined by an observer it seemed to affect the group dynamics and the way they worked.

Lesson 3: Use of visual tools in AIM – Systems maps, Composite map, Activity models

It was found to be helpful if the participants are given a brief introduction of how to use the software. It is worth noting that this became a part of the 1-2-1 sessions where any participant who did not feel technically skilled enough to make modifications and changes him/herself was given support. Examples and demonstrations of the session outcomes and expectations became crucial in order to explain the purpose of each session (particularly phase 1), but especially so for phase 3, where activity models might have been puzzling even to academic participants or those new to 'Systems'. It is recommended that a simple, easily understood example from everyday life, is given prior to each phase.

Lesson 4: AIM language and 'systems' terminology

It was noted that there was some confusion and misunderstanding with the use of 'Systems' terms and the names of some of the activities in AIM e.g. Systems Maps. It is likely that using soft action research will be unfamiliar to most researchers but also the 'new' environment of inquiry online may have been a factor, too. An effort to use simple language is recommended, especially in the 'international environment'.

Explanation and guidance were helpful to participants in the phase 2, as was the individual discussion that seemed to help them to stay focused, on topic and to clarify any differences in their examples.

Conclusion

In conclusion, there are number of lessons learnt throughout the employment of action research in the online environment. The Covid-19 pandemic with the moratorium on face-to-face encounters and increased number of people working from home created challenges as well as opportunities to action researchers and soft methods of inquiry. The advantages and disadvantages of each platform were considered and tested on the pilot study. What might have seemed to be the best choice of technology in theory may not necessarily be the same when it comes to practice. Some platforms that appeared to fit all the research requirements, such as being user friendly and convenient for participants were judged to be impractical. There were

also platforms that did not deliver or did not allow the researchers to use the listed features or benefits as promised upon the purchase. This experience was part of the continuous cycle of learning gained from both the process of online inquiry and the application of AIM. We believe this paper highlights some useful lessons for other research applying soft methods of inquiry online.

Implications for future research

Whilst the Covid-19 pandemic and its restrictions affected various types of research, it has also created opportunities to explore alternative strategies to undertake field research, using ICT platforms. This study has indicated that similar research may benefit in some form to be conducted online, partly or fully, to overcome certain limitations. For instance, the use of ICT platforms for soft method of inquiry has offered an alternative choice that is more economic and in some cases more time efficient (e.g. no commuting or travel costs) for undertaking field studies. It may also hold a potential to be used for international projects. But we draw attention to the importance of boundary setting to avoid creating a large community of participants that may be difficult to ‘manage’. However, flexibility and adaptability of such field research should be considered with its extent of changes that may be limited for online collaboration and research by the available software.

An investigation into a hybrid approach for field research, combining face-to-face and online action research, might be a way forward. It should be borne in mind that the balance of benefits and drawbacks from each approach may require a compromise at certain aspects.

References

- Champion, D. and Stowell, F.A. (2001) “PEArL: A Systems Approach to Demonstrating Authenticity in Information System Design”, *Journal of Information Technology*, Vol. 16, pp. 3-12. DOI: 10.1080/02683960010028438.
- Champion, D., & Stowell, F. A. (2003). Validating Action Research Field Studies : PEARL. *Systems Practice and Action Research*, 16(1), 21–36. DOI: <https://doi.org/10.1023/A:1021928511690>.
- Checkland, P.B. (1999), *Systems Thinking, Systems Practice*, includes 30-year retrospective, Chichester: Wiley and Sons.
- Cooray, S. (2010). End-user driven development of information systems: revisiting Vickers' notion of ‘appreciation’. PhD Thesis, (unpublished), University of Portsmouth.
- Cummins, S., & Macintyre, S. (2002). “Food deserts”---evidence and assumption in health policy making. *British Medical Journal*, 325(7361), 436–438. DOI: <https://doi.org/10.1136/bmj.325.7361.436>.
- Lu, W., & Qiu, F. (2015). Do food deserts exist in Calgary, Canada? *Canadian Geographer*, 59(3), 267–282. DOI: <https://doi.org/10.1111/cag.12176>.

Stowell, F.A. (2012), The Appreciative Inquiry Method A Suitable Framework for Action Research? *Systems Research and Behavioural Science*, Volume 30, Issue 1 pp15-30. DOI: <https://doi.org/10.1002/sres.2117>.

Stowell, F. A. (2021) The Appreciative Inquiry Method: From knowledge elicitation to organisational inquiry. *Systems Research and Behavioural Science*, 30(1), 15-30. DOI: <https://doi.org/10.1002/sres.2806>.

Stowell, F., & Cooray, S. (2017a). Virtual Action Research for Virtual Organisations? *Systemic Practice and Action Research*, 30 (2), 117–143. DOI: <https://doi.org/10.1007/s11213-016-9384-5>.

Stowell, F. and Cooray, S., (2017b), The Appreciative System, Learning and Its Impact upon Information Systems Design, *Communications of the Association for Information Systems*, 40(1), 93-119. DOI:10.17705/1CAIS.04006.

Stowell, F. & Welch, C. (2012). *The Managers Guide to Systems Practice, Making Sense of Complex Problems*. Wiley, Chichester.

Susman, G. I., and Evered, R. D. (1978). An Assessment of the Scientific Merits of Action Research. *Administrative Science Quarterly*, 23(4), 582-603. DOI: <http://dx.doi.org/10.2307/2392581>.

Ulrich, W., (1994) *Critical Heuristics of Social Planning*, Haupt, Bern.

Vickers, G. (1983). *Human Systems are Different*, London: Harper and Rowe.

West, D. (1995). The appreciative inquiry method: a systemic approach to information systems requirements analysis. In F. A. Stowell (Ed.), *Information systems provision: The contribution of soft systems methodology*. Maidenhead: McGraw-Hill. pp. 140–158.

Wrigley, N. (2002). “Food deserts” in British cities: Policy context and research priorities. *Urban Studies*, 39(11), 2029–2040. DOI: <https://doi.org/10.1080/0042098022000011344>.

Gamification and Virtual Reality for Communicating Ecoliteracy and Climate Science – Carbon Transport in the Essequibo River at Iwokrama Guyana. A Multidisciplinary approach.

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Abstract

The environmental, social, and political challenges of the 21st century are interconnected and interdependent; they are systemic. The relationships between climate, the economy, energy, food, our mindsets, and many other factors are interdependent, interrelated, complex, and cover local to global scales. Secondly there is an exponential growth in new and disruptive applications of digital technology including virtual and augmented reality.

In order to mitigate the impact of climate change, we will need to navigate and manage this complexity in an inclusive manner. We will need to promote environmental and climate science, ecoliteracy and systems thinking widely. Systems thinking gives us the conceptual tools and language to embrace complexity by understand relationships, patterns, and context (Capra & Luisi, 2014) and ecoliteracy may be defined as “*an understanding of the principles of the organization of ecosystems and the application of those principles for creating sustainable human communities and societies.*” (McBride, Brewer, Berkowitz & Borrie, 2013).

The use of virtual reality (VR) at the Iwokrama International Centre for Rainforest Conservation and Management (IIC), Guyana began when the Carbon-Water Dynamics Team at the Lyell Centre, UK were looking to find ways of disseminating their climate science work both to scientific and non-scientific stakeholders alike, recognising that traditional models of presenting research to invoke wider transformational change have limited impact (Serman, 2016)

“*A systems approach begins when first you see the world through the eyes of another*” (Churchman, 1968 p. 231). One of the central tenets of systems thinking is understanding that social reality is co-created by human beings who may hold different often contradictory perspectives for a situation of interest, arising from differing assumptions, understanding and mental models. When understanding complexity, it is beneficial to consider as many perspectives as possible. One of the promising aspects of IVR experiences is that it allows players to be viscerally “present” as another in a roleplaying game.

There are claims that VR headsets are “empathy machines”. If empathy is the ability to sense other people’s emotions and imagine what it’s like to be the other person, then VR will only invoke empathy if the application is designed to do so.

We present a combined physical and virtual reality game experience that invites players to become “virtual” climate scientists in the Amazon rainforest using VR technology, and role play as participants at a UN climate summit using the system dynamics policy simulator enROADS. This aims to achieve environmental transformational change where, traditionally, presentation of research alone has not been effective.

References

Capra, F. & Luisi, P.L. (2014). *The Systems View of Life*. Cambridge University Press.

Churchman, C.W. (1968). *The Systems Approach*. Dell Publishing Company.

McBride, B.B., Brewer, C.A., Berkowitz, A.R., & Borrie, W.T. (2013). Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here? *Ecosphere*, 4(5), 1-20. DOI: <https://doi.org/10.1890/ES13-00075.1>

Sterman, J. (2016). *John Sterman Addresses Ban Ki-Moon on the Need for Deeper Emissions Cuts*. Available at <https://www.climateinteractive.org/media-coverage/john-sterman-addresses-ban-ki-moon-on-the-need-for-deeper-emissions-cuts/> (Accessed on 26/10/2020).

Keywords: Climate science; Carbon cycles; Gamification; Digital Technology for Social Good; Virtual Reality; Role Playing; Systems Thinking Climate Change; Ecoliteracy; Amazon rainforest; System Dynamics.

Omnichannel Retail from a Systems Thinking Perspective

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Abstract

Digital transformation is becoming the norm in every industry, and challenging traditional business models and processes as well as enabling new opportunities for value creation. Within the retail industry, digital transformation has moved beyond the initial computerization of physical stores and the launch of e-commerce and mobile commerce. At the same time, but not always at the same speed, customers have adopted and adapted to evolving digital technologies and services, changing their expectations and behaviors.

The ongoing digital transformation within retail is now at a point where whether retailers offer and customers use physical or digital channels have become of less importance, instead, harmonizing and integrating channels into one seamless shopping experience has become of greatest importance. This concept of omnichannel retailing is one of the new opportunities for value creation. However, how to successfully conduct the transformation into an omnichannel business model has proven to be problematic, unclear, and in its infancy. The challenge is one of managing complexity as omnichannel tends to come with more digital technologies and services to integrate and use; processes to connect; relationships to manage, diverse perspectives and logics to align; boundaries to erase and establish. One appropriate approach to address such a complex, problematic situation is to use system thinking.

Systems thinking approach aims at simplifying the process of thinking and managing complex realities, which have been described by system thinkers as “wicked problems”. These problematic situations are characterized by an ill formulated and confusing situation where many decision-makers with conflicting values are involved. System thinking provides ways of selectively handling the details that complicate thinking into a transparent way, to reveal the underlying features of a complex situation. When more than one player is involved in a system such as omnichannel retailing, the interconnections among them cannot be ignored as the omnichannel experience depends on all players playing in sync. Non-systems thinking may prevail cannibalization and competition among channels (digital and physical) by ignoring the interconnectedness. The system thinking lens uncovers the processes by which beneficial changes might occur that can change the business model and support an omnichannel setup. Further, the system thinking approach can provide a richer picture and understanding of the role of different business model elements and how they work together towards an omnichannel experience.

Business models are the blueprint of any organization. A business model is defined as the architecture of activities underling a firm's value creation, value delivery and value appropriation. One framework widely used in order to identify, describe and develop business models is the Business Model Canvas framework. The framework suggests that a business model is built around nine elements: value propositions, channels, customer relationship, customer segments, key resources, key activities, key partners, cost structure, and revenue streams. These elements have their unique properties which are uniquely interconnected for each company in order to bring out novel value creation opportunities. As companies embark on their omnichannel endeavor business model elements and their relationships change.

The purpose of the paper, based on a literature review and a case study, is to use a Systems thinking perspective in order to investigate relationships and interactions between elements of the omnichannel business model. This in order to provide a deeper understanding of the complexity that omnichannel retailing entails and to contribute to enabling retailer readiness in the digital transformation journey. In the end, the paper provides a conceptual model which can be applied by retailers for their digital transformation.

Keywords: Omnichannel retail; Business model; System thinking; Digitalization.

A Hybrid Music Recommendation System using Mode-Specific Multi-dimensional Kernel Density Estimation based Clustering

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Abstract

A recommendation system is a system that process and filters any unwanted items from a stream of choices generated based on human interaction or experience. Any recommendation system should provide set of choices based on a comprehensive assessment of a given user's profile that includes feedback or preference. Leading organisations face complex challenges when providing recommendation services within large complex fields like music like computations, logistics and labour. One of the most efficient ways to defy such issues is by incorporating Systems thinking with machine learning based solutions that are fast, reliable, and efficient which can help navigate leaders in making adept decisions. The idea is to build a robust music recommendation system (MRS) using machine learning that can entrust user loyalty and increase sales of a desired product. Conventional recommendation systems provide suggestions either based on collaborative filtering method, content-based filtering methods selected individually or a hybrid method that combines both. Most of the existing MRS are trained using supervised techniques where any machine learning model is exposed to a given dataset with labels of user's feedback. This makes a given model biased towards the dataset and is highly prone to false positives when tested with an unseen data. In addition, most of the existing models are not dynamic i.e., once trained the parameters of the existing MRS are not updated with time and user's varying experience. This research proposes a hybrid recommendation model that is dynamic in nature and is independent of the labelling information. It also provides recommendations that are based on defined contexts and regularly updates with user's choices. The model proposes to use multi-dimensional kernel density estimation based clustering technique that considers user profile, either new or existing and suggest music items according to the closest cluster. KDE clustering is a non-parametric method to cluster multivariate user data using a smoothing parameter. For a new user, recommendations are provided based on the context selected including demographics, time etc. For an existing user, the hybrid model is implemented where the recommendations are provided based on the user's history and other users profile. In such a case, KDE clustering helps to cluster both the existing user along with other users' profiles. In addition to defining the pattern for user profiles, KDE clustering also helps in identifying the modes within a given profile which represents a region of influence within a cluster that has a significant probability

of occurrence. A multi-modal cluster helps a MRS to locate the existing clusters closest to any given mode and provide recommendations closest to the given mode rather than the whole cluster. This further helps in further filtering the recommendations and in reducing false positives. The whole approach is validated on a benchmark combined datasets collected from two different sources namely Last.fm-1b and Million song database. The proposed approach outperforms existing models by a significant margin in terms of accuracy and helps in reducing the false positives. To test the robustness of the approach, number of test users are also varied within a range and still achieves an accuracy rate of above 87%.

Keywords: Music Recommendation System; Systems thinking; Unsupervised Learning; KDE Clustering; Hybrid Recommendation System.

Bias in machine learning - A systemic view

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Abstract

One of the challenges faced by Machine Learning (ML) researchers is that an ML model can at times, produce results that are systemically prejudiced due to erroneous assumptions in the ML process (Gianfrancesco et al, 2019; Rouse 2020; Freidler et al, 2018). Bias can be introduced to the ML process by those involved in the design and training of the model or by those involved in the creation of the algorithms. A dataset used for training and testing an ML model can also have societal and personal bias embedded within it (Hao 2020; Yapo and Weiss, 2018). Typically, bias is introduced to the data when the subjective bias, assumptions, and experiences of those involved in ML design led them to make subjective judgments on the data. Such judgments include deciding on which instances, features/ data points are relevant enough to be included in the training and test data, deciding on how to label the training and test data, etc. This could result in a dataset that is not representative of all stakeholders, leading to outcomes that are inaccurate or even prejudicial against certain groups (Aggarwal, 2020; Mehrabi et al, 2019).

Here, we draw on the work of Gadamer (2013) and Systems Thinkers such as Checkland and Poulter (2006), Stowell and Welch (2012), and Jackson (2019) to propose that those involved in the design of ML datasets embark on a process of inquiry to reflect on and discuss their personal frames of reference/ horizons with regards to a ML project. We show that the analysis of this subjectivity can produce a more systemic understanding of the situation to be addressed by ML, and can help identify ways in which stakeholders may inadvertently add particular biases to the dataset. Such analyses can also provide other researchers insights into the subjective frames of reference through which the original data scientists prepared their datasets and reached their conclusions. As such, we define our first research objective as follows.

Research Objective 1: Develop a method for analyzing the personal horizons of data scientists and other stakeholders involved in ML design, and test whether it facilitates a reduction in bias being introduced to training and test datasets.

Second, we propose that identifying bias should begin with a systemic analysis of the wider social context in which an ML intervention is to be made, including its components, their interactions, and how they impact the situation as a whole. An analysis into the social environment would include but is not limited to, identifying the actors, consumers, those with formal and informal authority, environmental triggers, constraints, and methods of engagement of stakeholders. We argue that the analysis of this wider social environment within which the ML solution is to be located can assist in ensuring that all stakeholders and their corresponding features are adequately represented in the dataset thereby reducing exclusion bias (Jones, 2019), prejudice bias, and observation bias (Jian et al, 2019). We define our second research objective as follows.

Research objective 2: To develop a method to analyze the wider social system within which an ML intervention is to be made and to learn if this can reduce bias in ML

This study analyzes the experience of a grocery store chain in the US, that was in the initial stages of exploring strategies to attract diverse employees. A process that was highlighted as requiring further attention was the employee hiring process. One of the suggestions made was to consider procuring a Business Intelligence /AI tool to assist in candidate screening. The research was conducted with 8 groups of 5 members (4 staff members and 1 ML expert). All groups were tasked with identifying an initial structure for a dataset that could be used to train an AI model to make predictions on suitable candidates. 4 of the groups used systems tools to analyze their personal perspectives and the wider social situation within which the hiring process was carried out before they considered the composition of the training dataset. The rest of the groups immediately began the process of formulating the structure of the training dataset. An ML expert was present during each meeting to support the staff members if needed. Once the groups had prepared an initial structure for their training datasets, three diversity experts (including 2 with PhDs) were asked to examine the structure of the datasets for bias and fill out a survey for each group. The Systems tools applied in this exercise were the CATWOE mnemonic (Checkland and Poulter, 2006), Systems Maps (Stowell and Welch, 2012), and the PEARL mnemonic (Champion and Stowell, 2003). We also formulated several questions based on Soft Systems thinking to help stakeholders analyze their subjective views of the ML intervention (see Appendix A). We also formulated two sets of questions based on Soft Systems thinking to help participants analyze the organizational social context (both human and technical) within which the hiring process was located (see Appendix B).

In question 1 of the survey, we asked each diversity expert to rate their level of confidence in the proposed structure/ features of each group dataset being devoid of biases towards any protected group (e.g. race, religion, sexual orientation). The one-way ANOVA yielded a main effect for the use of systems tools, $F=17.38$, $P<.001$, such that the level of confidence in the lack of bias was significantly higher when systems tools were used ($M=4.33$) than when systems tools were not used ($M=3.66$). In question 2 of the survey, we asked each diversity expert to rate how confident they were that when the data for the proposed features were collected that the full dataset would not contain a significant amount of societal, personal, and other biases. The one-way ANOVA did not yield a main effect for the use of systems tools, $F=2.89$, $P>.05$. Interviews were also conducted with the diversity experts to ascertain if any common themes arose during their analysis of the datasets provided by the groups.

Keywords: Systems thinking; machine learning; bias.

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