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THE BASIS OF CLINICAL TRIBALISM, HIERARCHY AND STEREOTYPING: A LABORATORY-CONTROLLED TEAMWORK EXPERIMENT

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Abstract

Objectives: To examine the basis of multidisciplinary teamwork. In real-world healthcare settings, clinicians often cluster in professionally-based silos, form hierarchies and exhibit stereotypical behaviours. It is not clear whether this is a product of inherent characteristics of the individuals or groups comprising the professions, or attributable to workplace factors.

Setting: Controlled laboratory environment with well-appointed, quiet rooms and video and audio equipment.

Participants: Clinical professionals (n=133) divided into 35 groups of either doctors, nurses, and allied health professions; or mixed professions.

Interventions: Participants engaged in one of three team tasks, and their performance recorded and assessed.

Primary and secondary measures: Primary: teamwork performance. Secondary, pre-experimental: a bank of personality questionnaires designed to assess participants' individual differences. Post-experimental: The 16-item Mayo High Performance Teamwork Scale (MHPTS) to measure teamwork skills; this was self-assessed by participants and also by external raters. External, arm's length blinded observations of the videotapes was conducted.

Results: At baseline, there were few significant differences between the professions in collective orientation, most of the personality factors, Machiavellianism, and conservatism. Teams generally functioned well, with effective relationships exhibiting little by way of discernible tribal or hierarchical behaviours, and no obvious differences between groups ($F(3, 31)=0.94$, $p=0.43$).

Conclusion: Once clinicians are taken out of the workplace and put in controlled settings, tribalism, hierarchical and stereotypes behaviours largely dissolve. It is unwise therefore to attribute these factors to fundamental sociological or psychological differences between individuals in the professions, or group differences. Workplace cultures are more likely to be influential in shaping such behaviours. This underscores the importance of context in improvement activities. Future initiatives should factor in context rather than individuals' or professions' characteristics as the basis for inducing more lateral teamwork or better inter-professional collaboration.

Keywords: patient safety; teamwork; quality improvement; teams

Strengths and limitations of this study

- The first study in health care to examine clinicians' professional differences in controlled laboratory settings.
- Experimental novelty includes asking groups outside of their normal health care settings to undertake three experimental tasks to test their interactions.
- Participants were randomized to groups, but the overall inclusion of participants was purposive.
- Participants were tested for their ideology, personality, propensity for power, and team orientation using validated scales.
- Some professions (e.g., allied health professionals) were not represented in some of the experimental tasks.

THE BASIS OF CLINICAL TRIBALISM, HIERARCHY AND STEREOTYPING: A LABORATORY-CONTROLLED TEAMWORK EXPERIMENT

Background

Healthcare delivery systems ideally consist of well-functioning inter-professional teams working towards the common goal of caring for patients,[1] applying the best evidence,[2] and providing high quality, safe care. However, research on teamwork in health settings indicates that professional groups can hold differing views, perspectives and attitudes, as illustrated by survey studies of O'Leary et al[3] of 159 nurses and doctors, Wauben et al[4] of 221 surgeons, nurses, anaesthesiologists, and nurse anaesthesiologists and Gehring et al[5] of 630 primary care physicians and nurses.

Box 1: Definitions

Teamwork: The combined activities of a group of people working effectively toward common ends.[6]

Interprofessional: The skills of the different professions overlap.[7]

Multiprofessional: Professionals work alongside each other, relatively independently.[7]

Intraprofessional: Collaboration within a profession.[7]

Studies have also shown[8, 9] that providing team training of various types (e.g., Crew Resource Management (CRM), simulation training, teaching communication skills and introducing ward rounding) is related to improvements in attitudes and knowledge, and that interprofessional collaboration can improve as a consequence.[10-12] A systematic review found that 13 of 14 evaluation studies showed an enhancement in teamwork as a result of team-based interventions[13] and a Cochrane review of interprofessional collaboration showed that interprofessional rounds, meetings and an interprofessional audit can contribute to improved healthcare processes and outcomes in specific circumstances.[14] Cohesive healthcare teams are linked to improved patient outcomes and both patient and staff satisfaction.[1, 15] In essence, effective teamwork involves co-operation and communication between professional groups, as well as an understanding and respect for the different roles the professions play within the broader team.[16]

However, despite the shared objective of patient wellbeing, there is a widespread view, notwithstanding normative hopes for better teamwork, that clinical care is too often provided by tribes of relatively independent doctors, nurses and allied health professionals with low

levels of interaction between the professional groups.[6, 17] Doctors, nurses and allied health professionals often work intraprofessionally, tending to seek out other members of their own profession when problem-solving, seeking professional advice, or socialising.[18] Yet poor interprofessional collaboration can adversely affect the quality of care delivered to patients,[14, 19] with the potential for patients to fall through the system's cracks.[20] Substantial efforts to induce multidisciplinary teamwork,[21] interprofessional collaboration[10] and to traverse historical professional divides[22] are strong indicators that there is a need to address this issue. Such divisions act as barriers to more inclusive teamwork[23] and better care.[24]

It has proven difficult to create bridges across these professionally-based silos and integrate activities of workplace groups.[10] There are historical, cultural, behavioural and attitudinal reasons for the continuation of this state-of-affairs. Historically, gender divides existed within healthcare roles, with male doctors being hierarchically dominant, compared to the traditionally submissive nature of female nurses.[1] This resulted in a power imbalance and ongoing rivalries labelled "the doctor-nurse game"[25, 26] first noted almost 50 years ago. The emergence of a multiplicity of allied health professionals over the last forty years increased the range of services to patients but also the potential for further fragmentation of teamwork based on professional distinctions and gender differences.

So despite the breakdown of gender-restricted roles and other cultural typecasts across society as a whole, modern healthcare professionals still too-often appear to function in discipline-specific silos. Although doctors, nurses and allied health professionals share overall goals relating to the care of patients, they have differing histories, priorities, roles, expectations, education, and training, which often exacerbates disconnections between them.[16] Furthermore, organisational factors such as the physical layout of hospitals and differing staff shift schedules can limit the opportunities for interprofessional interactions,[16, 17] ultimately resulting in physical, social and psychological segregation of the professions from one another.

In-groups and out-groups in healthcare and elsewhere

Tajfel and Turner suggest that, beyond healthcare, poor group interactions can be explained by Social Identity Theory.[27] Individuals form groups based on compatible social factors such as class or race, or in the case discussed here, professional affiliation.[28] Thus, ubiquitous group identification, and a collective sense of belonging, influence individuals'

self-concepts and manifest as in-group versus out-group rivalries,[28] more colloquially known as the "us versus them" attitude. People within the same group tend to agree with, and show favouritism towards, fellow members of their group, whereas people outside of that group are often judged less favourably even in instances where group membership has been arbitrarily allocated.[29-31] Within healthcare settings, stereotypes about doctors, nurses and allied health professionals persist, e.g., doctors can often be viewed by others as strong leaders with high academic ability, but having poor interpersonal skills compared with nurses and allied health professionals;[32] nurses can be seen by others as hierarchical, and rule-oriented;[33, 34] and allied health staff can be considered by others as passive political players, and relatively powerless in the face of medical and nursing political structures.[35] We do not know the extent to which these stereotypes vary, or if the distinctions they represent hold under controlled conditions.

We do know that the attitude structures of the three main professional groups differ substantially, and this may be a core reason for poor levels of interprofessionalism when it manifests. In studies investigating their relative views on workplace issues such as interprofessional collaboration and teamwork structures, doctors tend to hold strong, certain, and critical attitudes;[11, 36] Nurses' attitudes tend to be collective, intense and polarised;[36] and allied health professionals tend to express the most positive attitudes, but feel less certainty about the attitudes they express.[36] It remains unclear to what extent the professionalised differences experienced anecdotally by participants in workplaces or measured on attitudinal scales are stereotypes or actual manifestations of behavioural repertoires. If we are to encourage greater levels of teamwork and interprofessional practice in support of improved quality of care, we need to understand the underpinnings for poor teamwork based on professional differences. One way to do this is to examine the interactions of the main clinical professional groups in controlled settings, i.e. by taking them out of the workplace cultures in which they are embedded, and to test their team orientations. These characteristics might be important in understanding the basis of *in situ* organisational silos, professional hierarchies, and tribal behaviours[36-40] which impede team-based care.

Aim

We aimed to characterise group behaviours of homogeneous groups of doctors, nurses and allied health professionals and heterogeneous groups combining members of all these professions, to investigate differences and similarities in their interactions and problem-solving approaches, in an experimental setting. On the basis of the foregoing, we

hypothesised that: [H1] Individual representatives of professional groups would show differences in their propensity for teamwork, attributable to their professional group characteristics e.g., in personality, collective orientation, conservatism, and teamwork style; [H2] Gender differences would be detectable amongst mixed teams and would be observed in tangible team role behaviours; [H3] Homogenous groups of doctors, nurses and allied health professionals would differ from each other in their teamwork style; and [H4] Heterogenous groups would interact differently, and be less team-orientated, when compared with homogeneous groups.

Method

Participants

Participants were 133 health professionals employed in the healthcare system in Australia. They comprised 24 doctors, 60 nurses, 39 allied health professionals, and a smaller number (10) of other health professionals, such as scientific officers who were combined with the heterogeneous groups. To facilitate enrolment, the study was included as an optional professional development activity as part of the program at two healthcare conferences in Australia in 2012 (the Annual Australasian Conference on Safety and Quality in Health Care in September 2012, and the Australian National Primary Health Care Conference in November 2012). Eighty-four participants were recruited in this way. A further 49 participants, all of whom had trained previously as doctors, nurses and allied health professionals, volunteered from a Masters program offered at the University of New South Wales in Sydney, Australia in 2013. No inducements were offered to any participants to elicit their task performance, but a prize of an Apple iPad was offered at the Primary Health Care Conference to test whether this improved participation rates. Eligibility for the iPad prize was contingent on participation, but not linked in any way to performance of the group tasks.

Study design

The study purpose-designed or modified and then applied three team-based experimental tasks to assess different aspects of intragroup interactions (Health Case-study Task, Jigsaw Puzzle Task, and Healthcare Budget Allocation Task) (see Figure 1). Participants volunteered for scheduled session times and were then randomly assigned to one of the three tasks. Within these tasks participants were randomly allocated to either a homogeneous or heterogeneous professional group, creating 35 groups in total. Some direct allocations were made so that each group had sufficient members from the appropriate professional groups. Homogeneous groups consisted of members whose training background was for a single profession (i.e.

either all doctors, or all nurses, or all allied health professionals) while heterogeneous groups consisted of members from more than one profession within the same team (i.e. a combination of doctors, nurses, allied health professionals and Others). Each task required individual groups to have a maximum of n=6 members and a minimum of n=3 members; however, the jigsaw task required synchronous participation of three individual groups to run a session. Efforts were made to have an equal number of members from each profession in mixed groups, but this was not always possible due to some participants' unavailability.

Materials

Pre-experimental questionnaires. Four pre-task personality questionnaires were used to assess individual differences between participants. These were: a ten-item version of the Big Five Inventory, measuring five personality dimensions: openness, conscientiousness, agreeableness, neuroticism and extroversion;[41] the 16-item Machiavellian Personality Scale, measuring Machiavellian tendencies such as distrust and manipulation of others;[42] the 15-item Collective Orientation Scale, assessing participants for their propensity to work collaboratively in a team environment;[43] and a 25-item modified version of the Henningham Social Conservatism Scale, measuring politically conservative values,[44] from which two items were removed as they were not relevant to the current study. In addition, an in-house demographic questionnaire recorded each participant's gender, age group, profession, type of institution in which they worked, years of experience in their current position, and years of postgraduate working experience. The 16-item Mayo High Performance Teamwork Scale (MHPTS), measuring the high performance teamwork skills[45] shown to be important contributors to patient safety[46, 47] was used as a post-task questionnaire to assess participants' views on how they had perceived their team's approach to the assigned task. Independent, trained raters were also given the MHPTS to assess group performance.

Experimental tasks. In addition to completing the rating scales described above, participants participated in one of the following team-based tasks.

Healthcare Case-study Task. Each participant in a team was provided with a purpose-designed healthcare case-study vignette that described a challenging healthcare management scenario. Each group was instructed to imagine they had been asked to resolve serious problems at a hospital. Participants were then asked to complete a structured response sheet detailing their group's proposed strategy to manage change in the problematic environment as well as an evaluation of their chosen strategy.

Jigsaw Puzzle Task. Three different 49-piece jigsaw puzzles were used in this task. Two pieces were removed from each jigsaw puzzle box and placed in the boxes of two of the other jigsaw puzzles (subsequently assigned to different teams), such that each jigsaw contained one piece from each of the other two puzzles. This jigsaw task was run among three groups simultaneously. Each group was provided with one of the three puzzles, disassembled and shuffled in a large envelope. Participants were asked to complete the jigsaw puzzle within ten minutes. No information was given regarding the missing pieces. Further details of the task are available elsewhere.[48]

Healthcare Budget Allocation Task. Each participant in each group was provided with a) a synopsis of the Australian Federal Government's Health Budget for the previous financial year, and b) the growth in health expenditure over the previous five years, in both dollars and as a percentage increase. In addition, a single-page of typed text provided definitions for each item specified in the health budget. Participants were instructed to use a purpose-designed response sheet to allocate expenditure to a list of sectors (e.g., aged-care, hospitals, research), as well as explain what they would do with the growth funding.

Settings and equipment. Each task was conducted in clean, well-appointed, quiet rooms equipped with tables and chairs as appropriate for each task. Since data collection occurred *in situ* at various locations, different rooms were used at different stages of the study. A video camera (Panasonic HDC-SD90 recording at 1920x1080i resolution) was mounted on a tall tripod and located to the front of each table of participants in order to maximise visibility of facial expressions, hand movements, and spoken interactions. A microphone (Zoom H4n) was unobtrusively placed at the table, and connected by wire to the video camera, to capture clear audio of participants' speech. In order to control for unintentional between-group differences in experimenter-participant interactions, the task instructions were recorded as a digital video file ("talking head") that was presented to participants using a digital projector prior to task commencement. The digital projector was also used to project the image of a countdown timer indicating the time remaining relevant to the specific task, which allowed participants to pace their task progress. Experimenters activated the instructional video at commencement of each task, and then left the room for the task duration.

Experimental study procedures

Prior to enrolling in the study, potential participants were informed (either as an

announcement at one of the conferences, or by the lecturer in the Masters course (JB)) that the task was an exercise to better understand interactions between individuals while working on a group task. At the conferences, participants were permitted to select the most convenient time from a number of available time-slots during the day. For students from the Masters course, the study was conducted during the usual class-time. Class members who elected not to participate were given a different class activity.

Participants were asked to read and sign information and consent forms before completing the battery of demographic and personality questionnaires. At this time they were also allocated a randomised numerical code number that would allow identification of individuals in the video recording, and eventual linkage with their responses to the questionnaires, while not revealing their identity or professional background to other participants or the research team members co-ordinating the study task. Thus, research team members were blinded to participant identity and professional background and JB did not participate in the experiments. After completion of the pre-task questionnaires, participants were brought into the task room, where each group of participants was seated at separate tables. No additional instructions were given as to how groups should operate or make decisions (e.g., whether they should decide by consensus or majority). At the end of the allocated time, the "talking head" video announced that the allocated time had expired and everybody should stop working on the task (if they had not already finished).

Post-experimental measures. Post experimental task measures consisted of (1) self-assessed MHPTS, (2) rater-assessed MHPTS, and (3) blinded observations. The MHPTS was administered immediately after the experimental tasks to all participants for later comparison with rater-assessed MHPTS scores. The MHPTS has been validated for self-assessment by novice healthcare team training participants,[45] and assessment by independent observers.[12] Once the research team collected all the task response sheets and post-task questionnaires, the participants were debriefed regarding the aims of the study and given the opportunity to ask questions.

The digital video files were transferred to DVDs in randomised order within groups, resulting in data of 35 groups performing tasks of 15-20 minutes duration each. The videos were analysed by three independent raters who were blinded to the professional composition of the group. Raters completed one half day of training on how to use the MHPTS prior to rating the video behaviours, and achieved high agreement when rating two practice scenarios. As an

additional measure of teamwork performance, blind observations were conducted by an independent observer. These semi-structured observations consisted of viewing all video tapes and noting team interactions using a guideline based on CRM teamwork skills including; communication, leadership, decision making, task management and situational awareness (see supplementary file 1).[49] The observation guideline was constructed by a researcher (RC-W) with extensive experience in CRM training and research in healthcare and other industries.

Behavioural data procedures. Behavioural data were cleaned and entered into an SPSS statistics datasheet (Version 22) missing values for questions 1 to 8 were allocated a '0', and missing values for questions 9 to 16 were allocated a '1' in accordance with published guidelines.[27] For self-assessed data, participants' ratings of the 16 behaviour statements for each scenario were summed, to give a participant team score for each scenario.

Ethics Approval

Ethics approval for the study was obtained from the UNSW Human Research Ethics Committee (UNSW HREC/HC12040). Active written consent was obtained from participants for all aspects of the research, including consent for audio-video recording of participant behaviours and later analysis.

Results

Participants

A total of 133 healthcare professionals participated in the study; the breakdown of participants by qualification, gender, age, experience, and time in current position is shown in Table 1. Participants worked in a large variety of healthcare settings, including public hospitals (n=53), private hospitals (n=8), community health services (n=13), general practice (n=11), academic organisations (n=4), health departments or other government agencies (n=19), consumer groups (n=1), and elsewhere in healthcare, or in more than one location or role (n=23).

Table 1. Participant demographics

Profession and gender	n	Age (yrs)	n	Postgraduate working experience	n	Time in current position	n

				(yrs)		(yrs)	
Doctor M 10 F 14	24	<25	3	<5	18	<5	82
Nurse M 9 F 51	60	26-35	37	6-10	25	6-10	30
Allied Health M 8 F 30	39	36-45	29	11-15	13	11-15	13
Other M 3 F 7	10	46-55	38	16-20	13	16-20	4
		56-65	24	>20	64	>20	3
		>65	2				

The number of groups completing each task, and their composition, is shown in Table 2. For the healthcare case-study task and healthcare budget allocation task, the smallest group size was n=3 and the largest was n=6 participants. For the jigsaw task, the smallest number of participants in each session was n=9 and the largest was n=18 participants.

Table 2. Group composition

Tasks	**Doctor groups (n)**	**Nurse groups (n)**	**Allied Health groups (n)**	**Mixed groups (n)**	**Total groups (n)**
Jigsaw	3	2	2	8	**15**
Budget Allocation	0	3	0	4	**7**
Case Study	0	3	2	8	**13**
Totals	**3**	**8**	**4**	**20**	**35**

Baseline T1 measures

Descriptive statistics for the participant population are shown in Table 3. ANCOVAs were conducted for each of the scales comparing doctors, nurses and allied health professionals, while controlling for gender. No significant differences were found between the professions in collective orientation, four of the five personality factors, Machiavellianism, or Conservatism. There was a significant difference between professions for one of the personality factors–Agreeableness–$F(3, 124)=0.19$, $p=0.021$, with As scoring as more agreeable (mean=4.1, SD=0.8) than 'Other' (mean=3.3, SD=0.9).

Table 3. Baseline measures–combined groups

Descriptive Statistics					
Factors	**n**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
Collective Orientation Score (COS) (Reverse scored, where a lower number indicated a higher COS)	133	.93	3.53	2.21	.46
Machiavellianism	133	1.56	4.00	3.27	.45
Openness	133	1.00	4.50	3.01	.60
Conscientiousness	133	1.00	4.00	2.13	.78
Agreeableness	133	1.50	5.00	3.93	.78
Neuroticism	133	1.00	4.50	2.51	.98
Extraversion	133	1.00	5.00	3.61	.96
Low Conservatism	119	1.00	3.00	2.42	.28

There was a significant effect of gender on Machiavellianism Scale scores after controlling for the effect of profession, $F(1, 124)=17.9$, $p<0.001$, with females scoring as more Machiavellian (mean=3.33, SD=0.40) than males (mean=2.98, SD=0.49). Both males and females appear to become significantly more Machiavellian the longer they had spent in their profession. There was a significant difference between female Machiavellianism scores for those who had between six and ten years' experience (mean=3.15, SD=0.097) and those with over 20 years' experience (mean=3.47, SD=0.06); mean difference=0.325, p=0.044, 95% CI [0.005-0.646]. There was a significant difference between male Machiavellianism scores for those who had less than five years' experience (mean=2.23, SD=0.21) and those with over 20 years' experience (mean=3.20, SD=0.12); mean difference=0.968, p=0.006, 95% CI [0.209-1.726].

Behavioural T2 data

Participants' self-assessed MHPTS scores were summed and averaged for each group to create a mean group score, with a maximum available score of 32, the highest possible teamwork score. For rater-assessed MHPTS data, scores on the 16 behaviour statements for each scenario were summed, to give each group a total score for each task. As is commonly found with the MHPTS instrument,[45] self-assessed scores were higher than independent rater scores (M=23.1, M=18.0, respectively), however the self-assessed scores were not able

to be used further due to the excessive variation of scores within groups (see Figure 2). In one Health Budget task, for example, self-assessed scores within one five person team varied from 14 to 28.

As raters were blinded and did not observe the same teams as each other, scores were not able to be correlated. Despite this, raters' scores had a high frequency distribution and similar distributions between raters (see Figure 3), which, in combination with high rater agreement shown when rating training scenarios, suggests a degree of consistency between raters' scoring. ANCOVAs were calculated using rater scores comparing homogeneous teams of doctors, nurses, allied health professionals, and combined teams, while controlling for gender. No significant differences were found between teams of different compositions, $F(3, 31)=0.94$, $p=0.43$.

Blinded observations

Observers reported that teams performed well, interactions were relatively smooth and functional, and participants were observed to contribute effectively to group outcomes. Case-study results, jigsaw completions and budget allocations were all attempted with due diligence. No obvious differences were apparent between homogenous and heterogeneous groups in problem-solving styles, teamwork orientation, tribalism, hierarchy or stereotypes.

No differences between groups' behaviours were identified based on CRM teamwork skills including communication, leadership, decision making, task management and situational awareness. Groups chose a scribe in studies which required a scribe and males were disproportionately selected. In the seven teams where both males and females were available to scribe males were scribes for five teams. Nurses were more likely to be scribes in the mixed heterogeneous groups. In the eight mixed groups which contained nurses they were scribes for five teams. In heterogeneous teams, doctors were more prone to ask a question, direct the project or (in the jigsaw task) discover that a puzzle piece was missing. On the eight occasions when questions were asked in mixed groups four were asked by doctors. The questions asked by doctors were typically of a nature designed to progress the task (e.g., "Should we move on?" or "Have we finished [task]?").

Discussion

This is the first study of its kind in health care, so far as we are aware. While well established in psychology and social psychology, conducting experimental work amongst healthcare

teams in controlled settings is at an embryonic stage.

Interprofessional teamwork is a cornerstone in delivering high quality, safe care. We took healthcare professionals out of their normal work environments and had them interact under different conditions to observe teamwork behaviours. We found few of the traditional, stereotypically-patterned behavioural differences that have been attributed to the professional groups, e.g., tribalism or clinical pecking orders.[6, 17] When these styles manifest in modern healthcare settings, as they seem to do ubiquitously[6, 10, 14, 17, 18, 20-22], then we can point to the workplace cultures as the genesis for the behaviours rather than intrinsically different characteristics of doctors, nurses and allied health professionals, or the individuals who make up the clinical professions.

In short, if you remove clinicians from their normal context, and put them in a controlled environment, tribalism, stereotypes and hierarchically-laden behaviours dissipate to a considerable extent. Thus, while Social Identity Theory offers a powerful explanation for professional group differences in health care settings, we did not detect such differences when we controlled for the setting by taking people out of it.

Profiles of participants

We found no major differences in demographic profiles, personality, Machiavellianism, Conservatism, or team orientation between professional groups at baseline. H1 was therefore not supported. On the strength of our data, contrary to expectations, there are few grounds for supposing *a priori* that any individual differences are the key influence in determining the characteristics of the professional groups.

There have been few studies examining the relationships between gender, personality, and ideology. We identified no gender differences other than in Machiavellianism, where females had higher scores than males. H2 is therefore rejected. For both genders Machiavellianism increased with number of years of professional experience. In particular, females with more than 20 years of experience were more likely to have higher Machiavellianism scores than those with less than 10 years of experience. Males with more than 20 years of experience were more Machiavellian than males with less than five years of experience. In practice, this may mean that individual clinicians become more aware of their capacity to exercise power with age and experience.

Self and raters' judgements of group performance

In regard to self-assessment of the teams' performance, there was little agreement between participants' judgements. Either participants have difficulty judging team-orientation, or they have little agreement on what constitutes a good team. Raters judged that team performance was smooth and functional and where team performance differed this could not be attributed to team composition.

Task performance

In actual task performance, the key problem-solving strategies of clinicians, in the team tasks we set them, was a kind of *collegial collaboration*. In heterogeneous teams, doctors were more likely to ask questions. Doctors were also more likely to direct progress in a task or point out if something was missing (e.g., a jigsaw puzzle piece). Throughout the three tasks, scribes tended to be male. In the non-jigsaw activities, nurses were more likely to be scribes, self-selected, in the mixed heterogeneous groups. This provides modest supporting evidence for the view that the clinical pecking order replicates itself outside of the workplace.[6, 17] But, apart from these minor instances, few other traditional stereotypical or hierarchical behaviours were observed. H3 was therefore only partially confirmed. We also found few discernible differences in team-orientation or task performance between homogenous and heterogeneous groups. H4 was therefore rejected.

Role behaviours

According to our results, if you invite clinical professionals to do teamwork under laboratory conditions, *in situ* workplace tribal and hierarchical behaviours are not readily replicated. There are grounds for believing, therefore, that stereotyping is an artefact of healthcare workplaces and history to a considerable degree.[16] Put another way, in the workplace there are perceptions of behavioural patterns of doctors, nurses and allied health professionals [32-35] that are not necessarily grounded in external reality or on the basis of demographic differences or personality, and do not manifest to any extent in controlled settings. For an explanation, it might well be that when displaying a stethoscope or wearing a white coat, a nursing uniform, a physiotherapist's outfit, or a technician's lab coat, this stimulates workplace participants to engage in the stereotypic behaviours that they have assimilated through mechanisms such as workplace socialisation, professional education, or the perpetuation of role-anchored behaviours.

Implications for policy and practice

People in health workplaces treat the professions differently. The results of this study suggest that it is best not to reinforce these differences, but to attempt to inculcate an egalitarian, collaborative ethos and culture.

We are left with a view suggesting that hierarchical behaviours, tribalism and stereotypes may be a hangover from prior eras, rooted in past history when doctors were male and nurses and allied health professionals were female,[25, 26] or where historical in-group bonds were strongly based on group identification. Pronounced power disparities between the professions manifested from the earliest eras, and healthcare participants *in situ* seem to hold on to these despite large-scale shifts towards equality and horizontal responsibilities in society in recent years. Stereotypical, hierarchical and tribal behaviours, put simply, did not arise in our controlled conditions; they seem to be an artefact of workplaces rather than a manifestation of *a priori* personality or individual psychological differences. Strengthening quality of care and delivering safer care to patients would, on the basis of this study, be enabled by more attention to the context in which teams operate, and the promotion of more egalitarian teamwork, shared decision-making and mutual responsibilities.

Conclusion

Overall, traditionally-patterned clinical workplace behaviours were rarely exhibited in a study with careful, triangulated measurements of team behaviours in external, controlled settings under a variety of tasks and conditions. It seems feasible to suggest that shaping workplace cultures, and taking steps to discourage professional tribalism, are key to creating more heterogeneous teamwork, rather than looking for more deeply-embedded sociological or psychological explanations rooted in the make-up of the individuals in these professions. Our data support the proposition that individual or group member characteristics are not the source of professional differences, and cannot be used to predict subsequent poor team orientation.

Strengths and limitations

Studies such as this cannot be completely randomised. Most psychology experiments enrol undergraduate students. A strength of this study was to include participants who held the actual *in situ* roles we sought to examine. Some people in the course or the conference from which the participants were drawn may have known each other, but we allocated people to groups randomly, so the effect is likely to be minimal. In addition, we used a teamwork rating scale that has been found to be effective for evaluating teamwork behaviours that improve patient safety. The populations from which participants were recruited were targeted towards

people training to be leaders in healthcare so the results might reflect their views rather than those of front line staff, although, mitigating that, almost all were actually in front line positions, either fully or partially. Stereotypes and in-group favouritism may have been more pervasive if participants were recruited from solely clinically-focused roles. Due to participants' availability, some groups were not represented in some of the experimental tasks. Homogenous groups of doctors and allied health professionals in the Budget Allocation Task, and homogeneous groups of doctors in the Case Study Task, were less well represented. This meant that some comparisons could not be made across all professional groups for all tasks.

List of abbreviations

CRM: Crew Resource Management; MHPTS: Mayo High Performance Teamwork Scale.

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Authors' contributions

JB conceived of the study, did the initial design work, and drafted the manuscript. RC-W, MW and JW worked the initial design in conjunction with JB into a final design. EV developed the laboratory and field materials. RC-W, DM, EV and TH (and SD) conducted the field work. BB reviewed and synthesised the digital video files. RC-W and MW executed various aspects of the statistical work. KL assisted with the analysis, literature reviews, and the post-developmental editing of the manuscript. All authors read, commented on and approved the final version of the manuscript.

Competing interests

The authors declare they have no competing interests.

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Data sharing statement

No additional data available.

Figure 1. Study design

Figure 2. Mayo High Performance Teamwork Scale self-assessed scores

Figure 3. Frequency distribution of raters' Mayo High Performance Teamwork Scale scores

Supplementary file 1 (optional): CRM-based guideline for semi-structured observations

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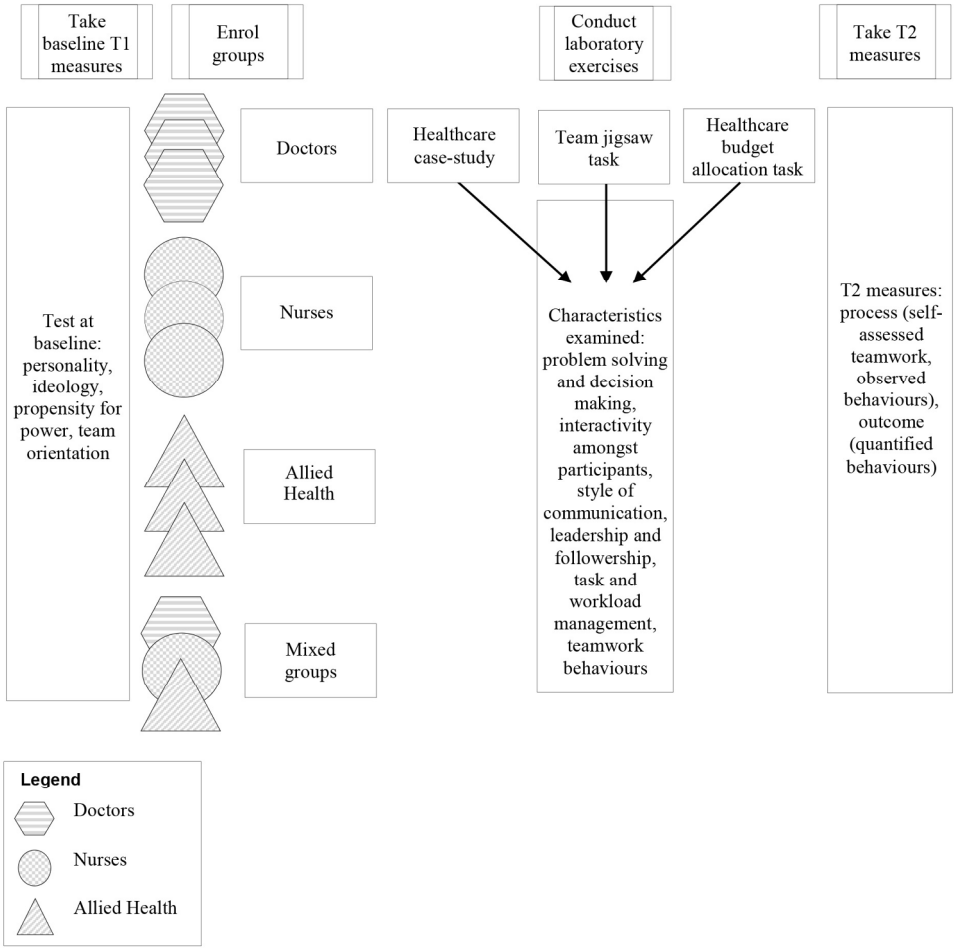

Study design

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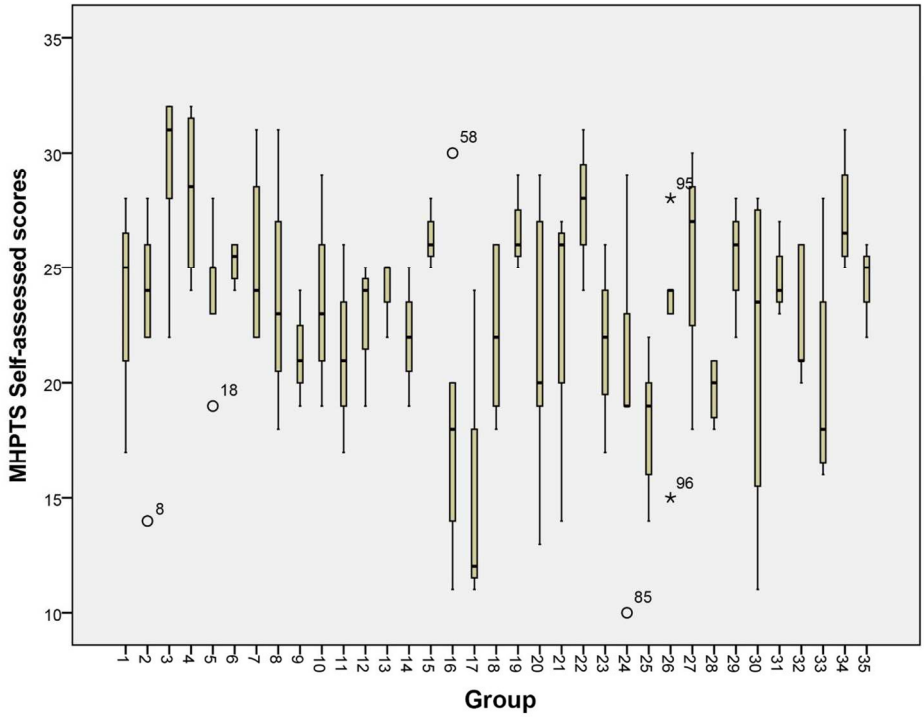
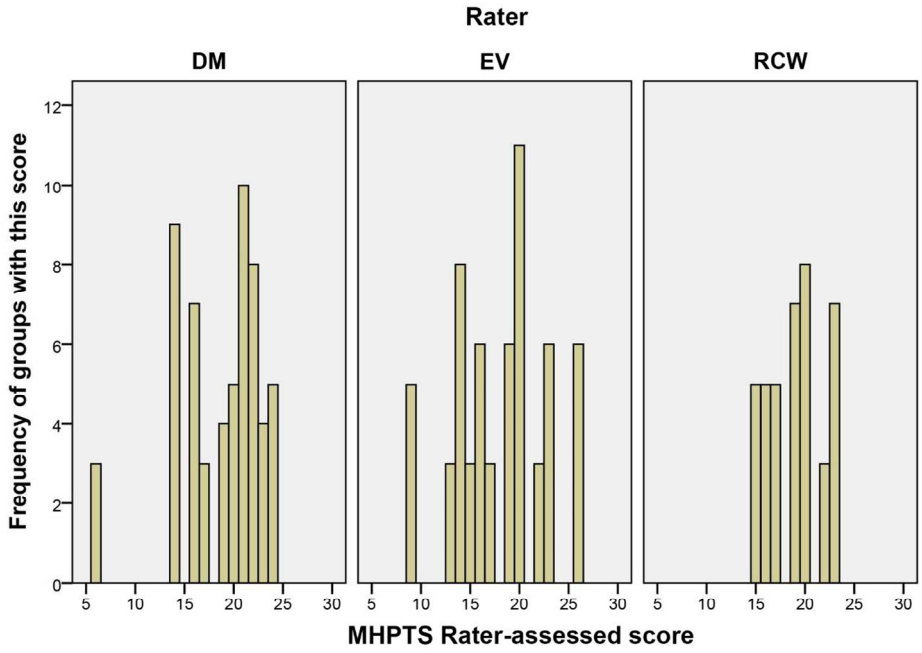


Mayo High Performance Teamwork Scale self-assessed scores

116x89mm (300 x 300 DPI)



Frequency distribution of raters' Mayo High Performance Teamwork Scale scores

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HREC Ref: # **HC12040**

Observer:_____ **Date:**_____

Session #:____**Table #:**____**Codes:**_____

Task Management

Behaviour	**Yes/No/Other**	**Comments**
Was the task completed?		
Time to complete task (mins:secs)		
Was this within allocated time?		
If not, did team stop at timer?		
Did team plan before starting task?		
Did team use available resources?		
Was workload distributed across team?		
For jigsaw: time to realise pieces missing?		
For jigsaw: time before interacting with other group(s)? Did they initiate?		
For jigsaw: who interacts (Code#)?		
For jigsaw: were interactions cooperative? Competitive?		
For jigsaw: did members assist other groups when completed (code#)?		

Leadership/Followership

Behaviour	Yes/No/Other	Comments
Was there a leader (code#)?		
Was leader selected/default?		
Type of leadership (authoritarian, democratic, laissez-faire?)		
Did leadership change?		
Were roles allocated? (Appointed? Self-appointed?)		
Did everyone participate?		
Were people encouraging (code#)? Discouraging (code#)?		
Was there any brief/debrief/feedback by leader?		
Did some members dominate (code#)?		

Communication

Behaviour	Yes/No/Other	Comments
Did the team share information?		
Did the team use common language?		
Verbal communication? Body language? Both? (code#)s?		
Were team members polite?		

Were some members very vocal (code#)? Quiet (code#)?		
Was the team generally noisy? Quiet? Any laughter?		
Was there conflict?		
If so, how managed?		
Did the team ask questions? Of each other? Outside the team?		
Were some members very vocal (code#)? Quiet (code#)?		

Decision Making

Behaviour	Yes/No/Other	Comments
Were options identified?		
Were decisions made?		
Were decisions implemented?		
Were decisions reviewed?		

Situational Awareness

Behaviour	Yes/No/Other	Comments
Did they appear to be aware of time? Time pressure? Did they monitor time?		
Was the team aware of activities in other		

groups?		
Did the team focus on the task to exclusion of outside information?		
Did the team use information to anticipate (e.g. Changing strategy with impending time pressure)?		

Notes/Other info

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The basis of clinical tribalism, hierarchy and stereotyping: a laboratory-controlled teamwork experiment

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THE BASIS OF CLINICAL TRIBALISM, HIERARCHY AND STEREOTYPING: A LABORATORY-CONTROLLED TEAMWORK EXPERIMENT

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THE BASIS OF CLINICAL TRIBALISM, HIERARCHY AND STEREOTYPING: A LABORATORY-CONTROLLED TEAMWORK EXPERIMENT

Abstract

Objectives: To examine the basis of multidisciplinary teamwork. In real-world healthcare settings, clinicians often cluster in professionally-based, tribal silos, form hierarchies and exhibit stereotypical behaviours. It is not clear whether these social structures are more a product of inherent characteristics of the individuals or groups comprising the professions, or attributable to a greater extent to workplace factors.

Setting: Controlled laboratory environment with well-appointed, quiet rooms and video and audio equipment.

Participants: Clinical professionals (n=133) divided into 35 groups of doctors, nurses, and allied health professions; or mixed professions.

Interventions: Participants engaged in one of three team tasks, and their performance was video-recorded and assessed.

Primary and secondary measures: Primary: teamwork performance. Secondary, pre-experimental: a bank of personality questionnaires designed to assess participants' individual differences. Post-experimental: The 16-item Mayo High Performance Teamwork Scale (MHPTS) to measure teamwork skills; this was self-assessed by participants and also by external raters. In addition, external, arm's length blinded observations of the videotapes was conducted.

Results: At baseline, there were few significant differences between the professions in collective orientation, most of the personality factors, Machiavellianism, and conservatism. Teams generally functioned well, with effective relationships, and exhibited little by way of discernible tribal or hierarchical behaviours, and no obvious differences between groups ($F(3, 31)=0.94$, $p=0.43$).

Conclusion: Once clinicians are taken out of the workplace and put in controlled settings, tribalism, hierarchical and stereotypes behaviours largely dissolve. It is unwise therefore to attribute these factors to fundamental sociological or psychological differences between individuals in the professions, or aggregated group differences. Workplace cultures are more likely to be influential in shaping such behaviours. The results underscore the importance of culture and context in improvement activities. Future initiatives should factor in culture and

context as well as individuals' or professions' characteristics as the basis for inducing more lateral teamwork or better inter-professional collaboration.

Keywords: patient safety; teamwork; quality improvement; teams

Strengths and limitations of this study

- The first study in health care to examine clinicians' professional differences in controlled laboratory settings.
- Experimental novelty included asking groups outside of their normal health care settings to undertake three experimental tasks to test their interactions.
- Participants were randomized to groups, but the overall inclusion of participants was purposive.
- Participants were tested for their ideology, personality, propensity for power, and team orientation using validated scales.
- Some professions (e.g., allied health professionals) were not represented in some of the experimental tasks.

THE BASIS OF CLINICAL TRIBALISM, HIERARCHY AND STEREOTYPING: A LABORATORY-CONTROLLED TEAMWORK EXPERIMENT

Background

Healthcare delivery systems ideally consist of well-functioning inter-professional teams working towards the common goal of caring for patients,[1] applying the best evidence,[2] and providing high quality, safe care within complex organisational contexts and cultures. However, research on teamwork in health settings indicates that professional groups can hold differing views, perspectives and attitudes, as illustrated by survey studies of O'Leary et al[3] of 159 nurses and doctors, Wauben et al[4] of 221 surgeons, nurses, anaesthesiologists, and nurse anaesthesiologists and Gehring et al[5] of 630 primary care physicians and nurses. Please refer to Box 1 for the definitions of terms used throughout this paper.

Box 1: Definitions

Hierarchy: A layered social structure which conceptualises superior and subordinate relationships transitively, in rank order; often depicted graphically e.g. in an organisational chart. In healthcare, the 'clinical pecking order' is one key example.

Interprofessional: The skills of the different professions overlap.[6]

Intraprofessional: Collaboration within a profession.[6]

Multiprofessional: Professionals work alongside each other, relatively independently.[6]

Organisational context: The setting in which practice takes place.[7]

Organisational culture: Recurring patterned behaviours, practices, attitudes and values describing settings infused with an ethos of 'the way we do things around here' contrasted with 'the way they do things over there'.[8]

Stereotype: The pattern of characteristics that are attributed to a group external to one's own reference group; often, out-groups are assessed to be inferior, with negative characteristics, and one's own group to have superior, or positive characteristics.

Teamwork: The combined activities of a group of people working effectively toward common ends.[9]

Tribe: An in-group exhibiting strong bonds with tendencies toward inward social loyalty and conformity across the membership.

Studies have also shown[10 11] that providing team training of various types (e.g., modelling Crew Resource Management (CRM), conducting simulation training, teaching communication skills and introducing ward rounding) is related to improvements in attitudes

and knowledge, and that interprofessional collaboration can improve as a consequence.[12-15] A systematic review found that 13 of 14 evaluation studies demonstrated an enhancement in teamwork as a result of team-based interventions[16] and a Cochrane review of interprofessional collaboration showed that interprofessional rounds, meetings and an interprofessional audit can contribute to improved healthcare processes and outcomes in specific circumstances.[17 18] Cohesive healthcare teams are linked to improved patient outcomes and both patient and staff satisfaction.[1 19] In essence, effective teamwork involves co-operation and communication between professional groups, as well as an understanding and respect for the different roles the professions play within the broader team.[20]

However, despite the shared objective of patient wellbeing, there is a widespread view, notwithstanding normative hopes for better teamwork, that clinical care is too often provided by tribes of relatively independent doctors, nurses and allied health professionals with low levels of interaction between the professional groups.[9 21] Doctors, nurses and allied health professionals often work intraprofessionally, tending to seek out other members of their own profession when problem-solving, seeking professional advice, or socialising.[22] Yet poor interprofessional collaboration can adversely affect the quality of care delivered to patients,[17 23] with the potential for patients to fall through the system's cracks.[24] Substantial efforts to induce multidisciplinary teamwork,[25] interprofessional collaboration[12] and to traverse historical professional divides[26] are strong indicators that there is a need to address this issue. Such divisions act as barriers to more inclusive teamwork[27] and better care.[28]

It has proven difficult to create bridges across these professionally-based silos and integrate activities of workplace groups.[12] There are historical, cultural, behavioural and attitudinal reasons for the continuation of this state-of-affairs. Historically, gender divides existed within healthcare roles, with male doctors being hierarchically dominant, compared to the traditionally submissive nature of female nurses.[1] This resulted in a power imbalance and ongoing rivalries labelled "the doctor-nurse game"[29 30] first noted almost 50 years ago. The emergence of a multiplicity of allied health professionals over the last forty years increased the range of services to patients but also the potential for further fragmentation of teamwork based on professional distinctions and gender differences.

So despite the breakdown of gender-restricted roles and other cultural typecasts across society

as a whole, modern healthcare professionals still too-often appear to function in discipline-specific groupings. Although doctors, nurses and allied health professionals share overall goals relating to the care of patients, they have differing histories, priorities, roles, expectations, education, and training, which often exacerbates disconnections between them.[20] Furthermore, organisational factors such as the physical layout of hospitals and differing staff shift schedules can limit the opportunities for interprofessional interactions,[20 21] ultimately resulting in physical, social and psychological segregation of the professions from one another.

In-groups and out-groups in healthcare and elsewhere

Tajfel and Turner suggest that, beyond healthcare, poor group interactions can be explained by Social Identity Theory.[31] Individuals form groups based on compatible social factors such as class or race, or in the case discussed here, professional affiliation.[32] Thus, ubiquitous group identification, and a collective sense of belonging, influence individuals' self-concepts and manifest as in-group versus out-group rivalries,[32] more colloquially known as the "us versus them" attitude. This is tribalism: the clustering of people with shared tendencies in an in-group. People within the same group tend to agree with, and show favouritism towards, fellow members of their group, whereas people outside of that group are often judged less favourably even in instances where group membership has been arbitrarily allocated.[33-35] Within healthcare settings, stereotypes about doctors, nurses and allied health professionals persist, e.g., doctors can often be viewed by others as strong leaders with high academic ability, but having poor interpersonal skills compared with nurses and allied health professionals;[36] nurses can be seen by others as hierarchical, and rule-oriented;[37 38] and allied health staff can be considered by others as passive political players, and relatively powerless in the face of medical and nursing political structures.[39] We do not know the extent to which these stereotypes vary, or if the distinctions they represent hold under controlled conditions.

We do know that the attitude structures of the three main professional groups differ substantially, and this may be a core reason for poor levels of interprofessionalism when it manifests. In studies investigating their relative views on workplace issues such as interprofessional collaboration and teamwork structures, doctors tend to hold strong, certain, and critical attitudes;[13 40] Nurses' attitudes tend to be collective, intense and polarised;[40] and allied health professionals tend to express the most positive attitudes, but feel less certainty about the attitudes they express.[40]

It remains unclear to what extent the professionalised differences experienced anecdotally by participants in workplaces or measured on attitudinal scales are stereotypes of the three professional groups or actual manifestations of behavioural repertoires. If we are to encourage greater levels of teamwork and interprofessional practice in support of improved quality of care, we need to understand the underpinnings for poor teamwork based on professional differences. One way to do this is to examine the interactions of the main clinical professional groups in controlled settings, i.e. by taking them out of the workplace cultures in which they are embedded, and to test their team orientations. These characteristics might be important in understanding the basis of *in situ* organisational silos, professional hierarchies, and tribal behaviours[40-44] which impede team-based care.

Aim

We aimed to characterise group behaviours of homogeneous groups of doctors, nurses and allied health professionals, and heterogeneous groups combining members of all these professions, to investigate differences and similarities in their interactions and problem-solving approaches, in an experimental setting. On the basis of the foregoing, we hypothesised that: *[H1] Individual representatives of professional groups would show differences in their propensity for teamwork, attributable to their professional group characteristics* e.g., in personality, collective orientation, conservatism, and teamwork style; *[H2] Gender differences would be detectable amongst mixed gender teams* and would be observed in tangible team role behaviours; *[H3] Homogenous groups of doctors, nurses and allied health professionals would differ from each other in their teamwork style;* and *[H4] Heterogeneous groups would interact differently, and be less team-orientated, when compared with homogeneous groups*.

Method

Participants

Participants were 133 health professionals employed in the healthcare system in Australia. They comprised 24 doctors, 60 nurses, 39 allied health professionals, and a smaller number (10) of other health professionals, such as scientific officers who were combined with the heterogeneous groups. To facilitate enrolment, the study was included as an optional professional development activity as part of the program at two healthcare conferences in Australia in 2012 (the Annual Australasian Conference on Safety and Quality in Health Care in September 2012, and the Australian National Primary Health Care Conference in

November 2012). Eighty-four participants were recruited in this way. A further 49 participants, all of whom had trained previously as doctors, nurses and allied health professionals, volunteered from a Masters program offered at the University of New South Wales in Sydney, Australia in 2013. No inducements were offered to any participants to elicit their task performance, but a prize of an Apple iPad was offered at the Primary Health Care Conference to test whether this improved participation rates. Eligibility for the iPad prize was contingent on participation, but not linked in any way to performance of the group tasks.

Study design

The study purpose-designed or modified and then applied three team-based experimental tasks to assess different aspects of intragroup interactions (health case-study task, jigsaw puzzle task, and healthcare budget allocation task) (see Figure 1). We used a variety of tasks to reduce bias inherent in choosing only one type of task. Participants volunteered for scheduled session times and were then randomly assigned to one of the three tasks. Within these tasks participants were randomly allocated to either a homogeneous or heterogeneous professional group, creating 35 groups in total. Some direct allocations were made so that each group had sufficient members from the appropriate professional groups. Homogeneous groups consisted of members drawn from a single profession (i.e. either all doctors, or all nurses, or all allied health professionals) while heterogeneous groups consisted of members from more than one profession within the same team (i.e. a combination of doctors, nurses, allied health professionals and others). Each task required individual groups to have a maximum of n=6 members and a minimum of n=3 members; however, the jigsaw task required synchronous participation of three individual groups to run a session (with a minimum of n=9). Efforts were made to have an equal number of members from each profession in mixed groups, but this was not always possible due to some participants' unavailability.

Materials

Pre-experimental questionnaires. Four pre-task personality questionnaires were used to assess individual differences between participants. These were: a ten-item version of the Big Five Inventory, measuring five personality dimensions: openness, conscientiousness, agreeableness, neuroticism and extroversion;[45] the 16-item Machiavellian Personality Scale, measuring Machiavellian tendencies such as distrust and manipulation of others;[46] the 15-item Collective Orientation Scale, assessing participants for their propensity to work collaboratively in a team environment;[47] and a 25-item modified version of the

Henningham Social Conservatism Scale, measuring politically conservative values,[48] from which two items were removed as they were not relevant to the current study. In addition, an in-house demographic questionnaire recorded each participant's gender, age group, profession, type of institution in which they worked, years of experience in their current position, and years of postgraduate working experience. The 16-item Mayo High Performance Teamwork Scale (MHPTS), measuring the high performance teamwork skills[49] shown to be important contributors to patient safety[50 51] was used as a post-task questionnaire to assess participants' views on how they had perceived their team's approach to the assigned task. Independent, trained raters were also given the MHPTS to assess group performance.

Experimental tasks. In addition to completing the rating scales described above, enrolees participated in one of the following team-based tasks.

Healthcare Case-study Task. Each participant in a team was provided with a purpose-designed healthcare case-study vignette that described a challenging healthcare management scenario. Each group was instructed to imagine they had been asked to resolve serious problems at a hospital. Participants were then asked to complete a structured response sheet detailing their group's proposed strategy to manage change in the problematic environment as well as an evaluation of their chosen strategy.

Jigsaw Puzzle Task. Three different 49-piece jigsaw puzzles were used in this task. Two pieces were removed from each jigsaw puzzle box and placed in the boxes of two of the other jigsaw puzzles (subsequently assigned to different teams), such that each jigsaw contained one piece from each of the other two puzzles. This jigsaw task was run among three groups simultaneously. Each group was provided with one of the three puzzles, disassembled and shuffled in a large envelope. Participants were asked to complete the jigsaw puzzle within ten minutes. No information was given regarding the missing pieces. Further details of the task are available elsewhere.[52]

Healthcare Budget Allocation Task. Each participant in each group was provided with a) a synopsis of the Australian Federal Government's Health Budget for the previous financial year, and b) the growth in health expenditure over the previous five years, in both dollars and as a percentage increase. In addition, a single-page of typed text provided definitions for each item specified in the health budget. Participants were instructed to use a purpose-designed response sheet to allocate expenditure to a list of sectors (e.g., aged-care, hospitals, research),

as well as explain what they would do with the growth funding.

Settings and equipment. Each task was conducted in clean, well-appointed, quiet rooms equipped with tables and chairs as appropriate for each task. Since data collection occurred *in situ* at various locations, different rooms were used at different stages of the study. A video camera (Panasonic HDC-SD90 recording at 1920x1080i resolution) was mounted on a tall tripod and located to the front of each table of participants in order to maximise visibility of facial expressions, hand movements, and spoken interactions. A microphone (Zoom H4n) was unobtrusively placed at the table, and connected by wire to the video camera, to capture clear audio of participants' speech. In order to control for unintentional between-group differences in experimenter-participant interactions, the task instructions were recorded as a digital video file ("talking head") that was presented to participants using a digital projector prior to task commencement. The digital projector was also used to project the image of a countdown timer indicating the time remaining relevant to the specific task, which allowed participants to pace their task progress. Experimenters activated the instructional video at commencement of each task, and then left the room for the task duration.

Experimental study procedures

Prior to enrolling in the study, potential participants were informed (either as an announcement at one of the conferences, or by the lecturer in the Masters course (JB)) that the task was an exercise to better understand interactions between individuals while working on a group task. At the conferences, participants were permitted to select the most convenient time from a number of available time-slots during the day. For students from the Masters course, the study was conducted during the usual class-time. The small number of class members who elected not to participate (n=2) were given a different class activity.

Participants were asked to read and sign information and consent forms before completing the battery of demographic and personality questionnaires. At this time they were also allocated a randomised numerical code number that would allow identification of individuals in the video recording, and eventual linkage with their responses to the questionnaires, while not revealing their identity or professional background to other participants or the research team members co-ordinating the study task. Thus, research team members were blinded to participant identity and professional background and JB did not participate in the experiments. After completion of the pre-task questionnaires, participants were brought into the task room, where each group of participants was seated at separate tables. No additional instructions were given

as to how groups should operate or make decisions (e.g., whether they should decide by consensus or majority). At the end of the allocated time, the "talking head" video announced that the allocated time had expired and everybody should stop working on the task (if they had not already finished).

Post-experimental measures. Post experimental task measures consisted of (1) self-assessed MHPTS, (2) rater-assessed MHPTS, and (3) blinded observations. The MHPTS was administered immediately after the experimental tasks to all participants for later comparison with rater-assessed MHPTS scores. The MHPTS has been validated for self-assessment by novice healthcare team training participants,[49] and assessment by independent observers.[14] Once the research team collected all the task response sheets and post-task questionnaires, the participants were debriefed regarding the aims of the study and given the opportunity to ask questions.

The digital video files were transferred to DVDs in randomised order within groups, resulting in data of 35 groups performing tasks of 15-20 minutes duration each. The videos were analysed by three independent raters who were blinded to the professional composition of the group. Raters completed one half day of training on how to use the MHPTS prior to rating the video behaviours, and achieved high agreement when rating two practice scenarios. As an additional measure of teamwork performance, blind observations were conducted by an independent observer. These semi-structured observations consisted of viewing all video tapes and noting team interactions using a guideline based on CRM teamwork skills including; communication, leadership, decision making, task management and situational awareness (see supplementary file 1).[53] The observation guideline was constructed by a researcher (RC-W) with extensive experience in CRM training and research in healthcare and other industries.

Behavioural data procedures. Behavioural data were cleaned and entered into an SPSS statistics datasheet (Version 22), missing values for questions 1 to 8 were allocated a '0', and missing values for questions 9 to 16 were allocated a '1' in accordance with published guidelines.[27] For self-assessed data, participants' ratings of the 16 behaviour statements for each scenario were summed, to give a participant team score for each scenario.

Ethics Approval

Ethics approval for the study was obtained from the University of New South Wales'

(UNSW) Human Research Ethics Committee (UNSW HREC/HC12040). Active written consent was obtained from participants for all aspects of the research, including consent for audio-video recording of participant behaviours and later analysis.

Results

Participants

A total of 133 healthcare professionals participated in the study; the breakdown of participants by qualification, gender, age, experience, and time in current position is shown in Table 1. Participants worked in a large variety of healthcare settings, including public hospitals (n=53), private hospitals (n=8), community health services (n=13), general practice (n=11), academic organisations (n=4), health departments or other government agencies (n=19), consumer groups (n=1), and elsewhere in healthcare, or in more than one location or role (n=23).

Table 1. Participant characteristics

Demographic	Statistics
Profession & gender	Doctor: n=24 (10 male,14 female) Nurse: n=60; (9 male, 51 female) Allied Health: n=39; (9 male, 30 female) Other: n=10 (3 male, 7 female)
Age	Years: <25 (n=3), 25-35 (n=37), 36-45 (n=29), 46-55 (n=38), 56-65 (n=24), >65 (n=2)
Postgraduate experience	Years: <5 (n=18), 5-10 (n=25), 11-15 (n=13), 16-20 (n=13), >20 (n=64)
Time in current position	Years: <5 (n=82), 5-10 (n=30), 11-15 (n=13), 16-20(4), >20 (n=3)

There were 35 groups in total. For the healthcare case-study task and healthcare budget allocation task, the smallest group size was n=3 and the largest was n=6 participants. For the jigsaw task, the smallest number of participants in each session was n=9 and the largest was n=18 participants.

Professional group differences

ANCOVAs were conducted for each of the scales comparing doctors, nurses and allied health professionals, while controlling for gender. Previous research[54] suggested gender was the most important variable to control. The size of the sample precluded controlling for multiple variables in the analysis but post-hoc examination of the data showed no significant differences amongst variables, e.g., those associated with age or years since graduation. No

significant differences were found between the professions in collective orientation, four of the five personality factors, Machiavellianism, or Conservatism. There was a significant difference between professions for one of the personality factors–Agreeableness–F(3, 124)=0.19, p=0.021, with allied health staff scoring as more agreeable (mean=4.1, SD=0.8) than 'Other' (mean=3.3, SD=0.9).

Gender differences

There was a significant effect of gender on Machiavellianism Scale scores after controlling for the effect of profession, F(1, 124)=17.9, p<0.001, with females scoring as more Machiavellian (mean=3.33, SD=0.40) than males (mean=2.98, SD=0.49). Both males and females appear to become significantly more Machiavellian the longer they had spent in their profession. There was a significant difference between female Machiavellianism scores for those who had between six and ten years' experience (mean=3.15, SD=0.097) and those with over 20 years' experience (mean=3.47, SD=0.06); mean difference=0.325, p=0.044, 95% CI [0.005-0.646]. There was a significant difference between male Machiavellianism scores for those who had less than five years' experience (mean=2.23, SD=0.21) and those with over 20 years' experience (mean=3.20, SD=0.12); mean difference=0.968, p=0.006, 95% CI [0.209-1.726].

Homogenous teams of healthcare workers

Participants' self-assessed MHPTS scores were summed and averaged for each group to create a mean group score, with a maximum available score of 32, the highest possible teamwork score. For rater-assessed MHPTS data, scores on the 16 behaviour statements for each scenario were summed, to give each group a total score for each task. As is commonly found with the MHPTS instrument,[49] self-assessed scores were higher than independent rater scores (M=23.1, M=18.0, respectively), however the self-assessed scores were not able to be used further due to the excessive variation of scores within groups (see Figure 2). In one healthcare budget allocation task, for example, self-assessed scores within one five person team varied from 14 to 28.

As raters were blinded and did not observe the same teams as each other, scores were not able to be correlated. Despite this, raters' scores had a high frequency distribution and similar distributions between raters (see Figure 3), which, in combination with high rater agreement shown when rating training scenarios, suggests a degree of consistency between raters' scoring. ANCOVAs were calculated using rater scores comparing homogeneous teams of

doctors, nurses, allied health professionals, and combined teams, while controlling for gender. No significant differences were found between teams of different compositions, $F(3, 31)=0.94$, $p=0.43$.

Interaction in heterogeneous groups

Observers in the blinded observations reported that teams performed well, interactions were relatively smooth and functional, and participants were observed to contribute effectively to group outcomes. Case-study results, jigsaw completions and budget allocations were all attempted with due diligence. No obvious differences were apparent between homogenous and heterogeneous groups in problem-solving styles, teamwork orientation, tribalism, hierarchy or stereotypes.

No differences between groups' behaviours were identified based on CRM teamwork skills including communication, leadership, decision making, task management and situational awareness. Groups chose a scribe in studies which required a scribe and males were disproportionately selected. In the seven teams where both males and females were available to scribe, males were scribes for five teams. Nurses were more likely to be scribes in the mixed heterogeneous groups. In the eight mixed groups which contained nurses they were scribes for five teams. In heterogeneous teams, doctors were more prone to ask a question, direct the project or (in the jigsaw task) discover that a puzzle piece was missing. On the eight occasions when questions were asked in mixed groups four were asked by doctors. The questions asked by doctors were typically of a nature designed to progress the task (e.g., "Should we move on?" or "Have we finished [task]?").

Discussion

This is the first study of its kind in healthcare, so far as we are aware. While well established in psychology and social psychology, conducting experimental work amongst healthcare teams in controlled settings is at an embryonic stage. In a laboratory-based setting, participants still *ostensibly* bear the hallmarks of their socialisation (they are still doctors, nurses and allied health professionals, after all) but they were not, while in our laboratory setting, infused with the immediacy of the cultural milieu of their home workplace setting.

Interprofessional teamwork is a cornerstone in delivering high quality, safe care. When we took healthcare professionals out of their normal work environments and had them interact under different conditions to observe teamwork behaviours, we found few of the traditional,

stereotypically-patterned behavioural differences that have been attributed to the professional groups, i.e., tribalism, or hierarchical or stereotypical displays.[9 21] When these styles manifest in modern healthcare settings, as they seem to do ubiquitously,[9 12 17 21 22 24-26] then we can point to the workplace cultures as the genesis for the behaviours rather than intrinsically different characteristics of doctors, nurses and allied health professionals, or the individuals who make up the clinical professions.

In short, if you remove clinicians from their normal context, and put them in a laboratory environment, tribalism, stereotypes and hierarchically-laden behaviours dissipate to a considerable extent. Thus, while Social Identity Theory offers a powerful explanation for professional group differences in healthcare settings, we did not detect such professional identity differences when we controlled for the setting by taking people out of it.

Profiles of participants

We found no major differences in demographic profiles, personality, Machiavellianism, Conservatism, or team orientation between professional groups at baseline. *H1 was therefore not supported*: on the strength of our data, contrary to expectations, there are few grounds for supposing *a priori* that aggregated individual differences are the key influence in determining the characteristics of the professional groups. In fact, observers could not tell from the behaviours of participants in the three tasks who was a doctor, nurse or allied health professional.

There have been few studies in healthcare examining the relationships between gender, personality, and ideology. We identified no gender differences other than in one aspect—Machiavellianism, where females had higher scores than males: *H2 was therefore rejected*. For both genders Machiavellianism increased with number of years of professional experience. In practice, this may mean that individual clinicians of both genders become more aware of their capacity to exercise power with age and experience.

Self and raters' judgements of group performance

In regard to self-assessment of the teams' performance, there was little agreement between participants' judgements. Either participants have difficulty judging team-orientation, or they have little agreement on what constitutes a good team. Independent raters judged that team performance in the main was smooth and functional and where team performance differed this could not be attributed to team composition.

Task performance

We found few discernible differences in team-orientation or task performance between homogenous and heterogeneous groups. *H3 was therefore rejected*. In their laboratory task performance, the key problem-solving strategies of clinicians, in the team tasks we set them, was a kind of *collegial collaboration*. In heterogeneous teams, doctors were more likely to ask questions. Doctors were also more likely to direct progress in a task or point out if something was missing (e.g., a jigsaw puzzle piece). Throughout the three tasks, scribes tended to be male. In the non-jigsaw activities, nurses were more likely to be scribes, self-selected, in the mixed heterogeneous groups. This provides modest supporting evidence for the view that the clinical pecking order replicates itself outside of the workplace.[9 21] But, apart from these minor instances, few other traditional stereotypical or hierarchical behaviours were observed although there were many opportunities for these kinds of behaviour to manifest. *H4 was therefore only partially confirmed*.

Role behaviours

According to these results, if you invite clinical professionals to do teamwork under laboratory conditions, *in situ* workplace tribal and hierarchical behaviours are not readily replicated. Personal, rather than professional behaviour, dominates in the laboratory. There are grounds for believing, therefore, that stereotyping is an artefact of healthcare workplaces and history to a considerable degree.[20] Put another way, in the workplace there are perceptions of marked behavioural patterns distinguishing doctors, nurses and allied health professionals.[36-39] Our study suggests that these are not necessarily grounded in external reality, nor are they formed on the basis of demographic differences or personality; they simply do not manifest to any extent in controlled settings.

For an explanation, it might well be that when displaying a stethoscope or wearing a white coat, a nursing uniform, a physiotherapist's outfit, or a technician's lab coat, this stimulates workplace participants to project stereotypic behaviours that they have assimilated through mechanisms such as workplace socialisation, professional education, or the perpetuation of role-anchored behaviours. It is important to remember that clinicians will tend to be more role-oriented and profession-centred (and even more Machiavellian and assertive) when *in situ* and their knowledge and status is involved. Take their artefacts away, and the context and culture might alter, often subtly, shifting toward more egalitarianism.

Implications for policy and practice

People in health workplaces treat the professions differently, and they behave according to established norms, tribal characteristics and in hierarchical and stereotypical ways. Indeed, "us" and "them" behaviours and attitudes pervade healthcare organisations. The results of this study suggest that for those wanting to promote greater levels of interprofessional teamwork in the real world, it is best not to reinforce these differences, but instead to attempt to inculcate a more equal, collaborative ethos and culture.

We are left with a view suggesting that hierarchical behaviours, tribalism and stereotypes may be a hangover from prior eras, rooted in past history when doctors were male and nurses and allied health professionals were female,[29 30] or where historical in-group bonds were strongly based on group identification. Pronounced power disparities between the professions manifested from the earliest eras, and healthcare participants *in situ* seem to hold on to these despite large-scale shifts towards equality and horizontal responsibilities in society in recent years. Stereotypical, hierarchical and tribal behaviours, put simply, did not arise in our controlled conditions; they seem to be an artefact of workplaces rather than a manifestation of *a priori* personality or individual psychological differences. Strengthening interprofessional teamwork would, on the basis of this study, be enabled by paying more attention to the characteristics of the workforce context in which teams operate, and the encouraging of more egalitarian team activities, shared decision-making and mutual responsibilities.

Conclusion

Overall, traditionally-patterned clinical workplace behaviours were rarely observed in a study with careful, triangulated measurements of team behaviours in external, controlled settings under a variety of tasks and conditions. It seems feasible to suggest that shaping workplace cultures by promoting inter-personal behaviours, and taking steps to discourage professional tribalism, are key to creating more heterogeneous teamwork, rather than looking for more deeply-embedded sociological or psychological explanations rooted in the make-up of the individuals in these professions. Our data support the proposition that individual or group member characteristics are not the source of professional differences, and cannot be used to predict subsequent poor cross-professional team orientation.

Strengths and limitations

Studies such as this cannot be completely randomised. Most psychology experiments enrol undergraduate students. A strength of this study was to include participants who held the

actual *in situ* roles we sought to examine. Some people in the course or the conference from which the participants were drawn may have known each other, but we allocated people to groups randomly, so the effect is likely to be minimal. In addition, we used a teamwork rating scale that has been found to be effective for evaluating teamwork behaviours that improve patient safety. The populations from which participants were recruited were targeted towards people training to be leaders in healthcare so the results might reflect their views rather than those of front line staff, although, mitigating that, almost all were actually in front line positions, either fully or partially. Nevertheless, we cannot rule out that stereotypes and in-group favouritism may have been more pervasive if participants were recruited from solely clinically-focused roles. Due to participants' availability, some groups were not represented in some of the experimental tasks. Homogenous groups of doctors and allied health professionals in the healthcare budget allocation task, and homogeneous groups of doctors in the Case-Study Task, were less well represented. This meant that some comparisons could not be made across all professional groups for all tasks.

List of abbreviations

CRM: Crew Resource Management; MHPTS: Mayo High Performance Teamwork Scale.

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Authors' contributions

JB conceived of the study, did the initial design work, and drafted the manuscript. RC-W, MW and JW worked the initial design in conjunction with JB into a final design. EV developed the laboratory and field materials. RC-W, DM, EV and TH (and SD) conducted the field work. BB reviewed and synthesised the digital video files. RC-W and MW executed various aspects of the statistical work. KL assisted with the analysis, literature reviews, and the post-developmental editing of the manuscript. All authors read, commented on and approved the final version of the manuscript.

Competing interests

The authors declare they have no competing interests.

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Data sharing statement

No additional data available.

Figure 1. Study design

Figure 2. Mayo High Performance Teamwork Scale self-assessed scores

Figure 3. Frequency distribution of raters' Mayo High Performance Teamwork Scale scores

Supplementary file 1 (optional): CRM-based guideline for semi-structured observations

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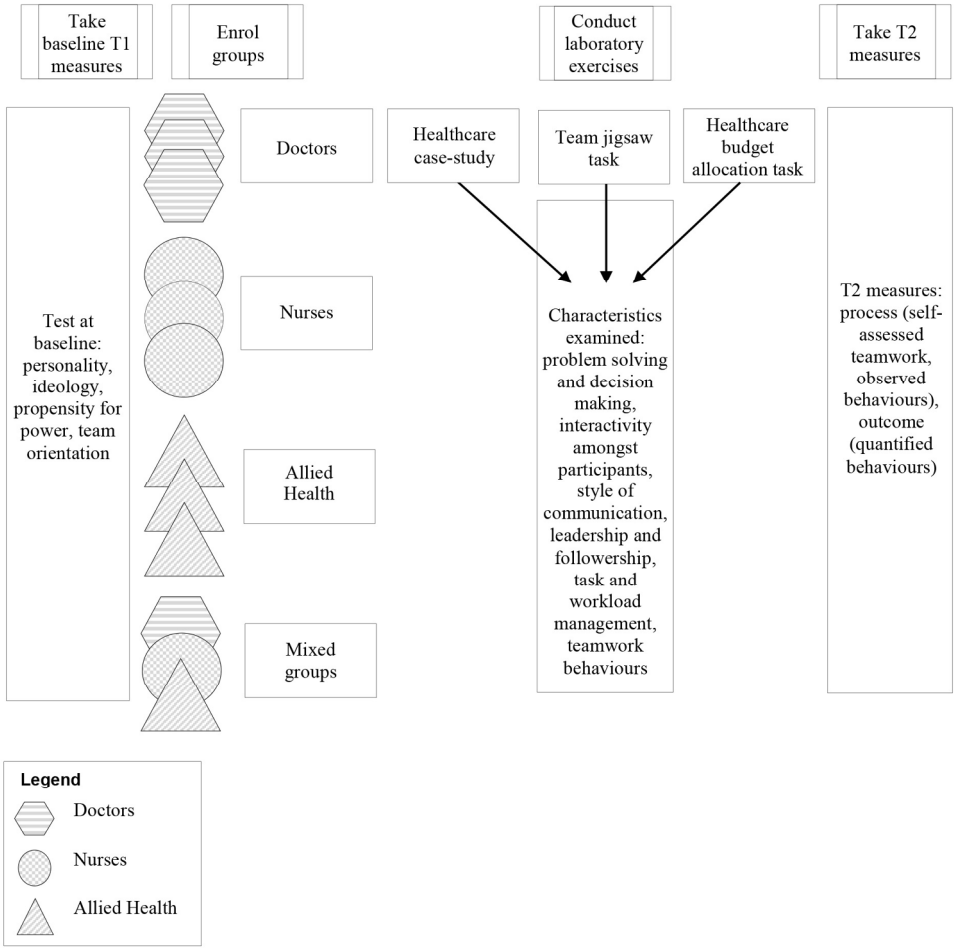
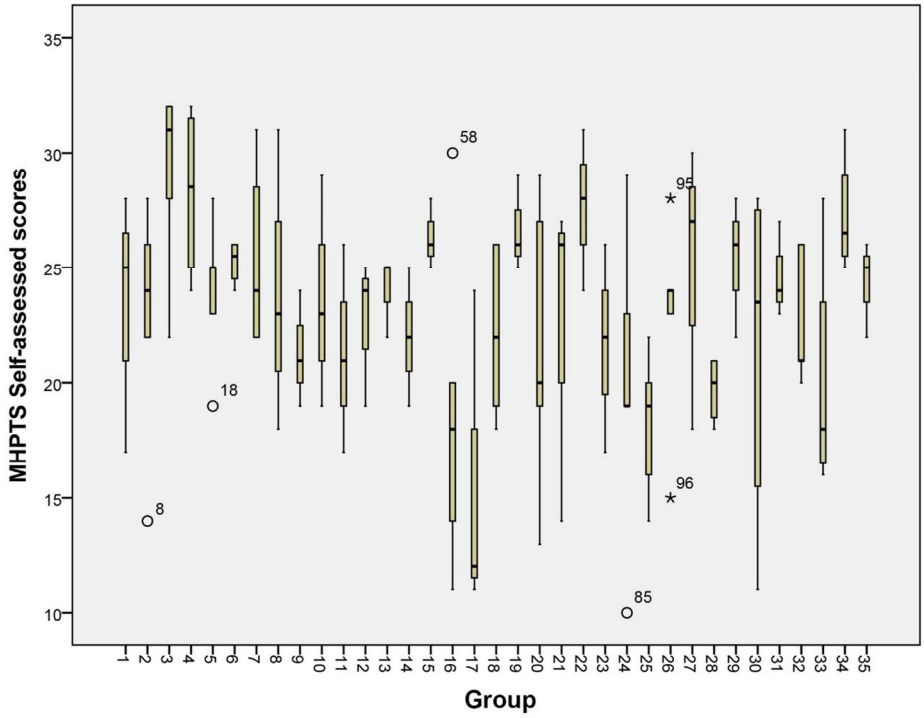


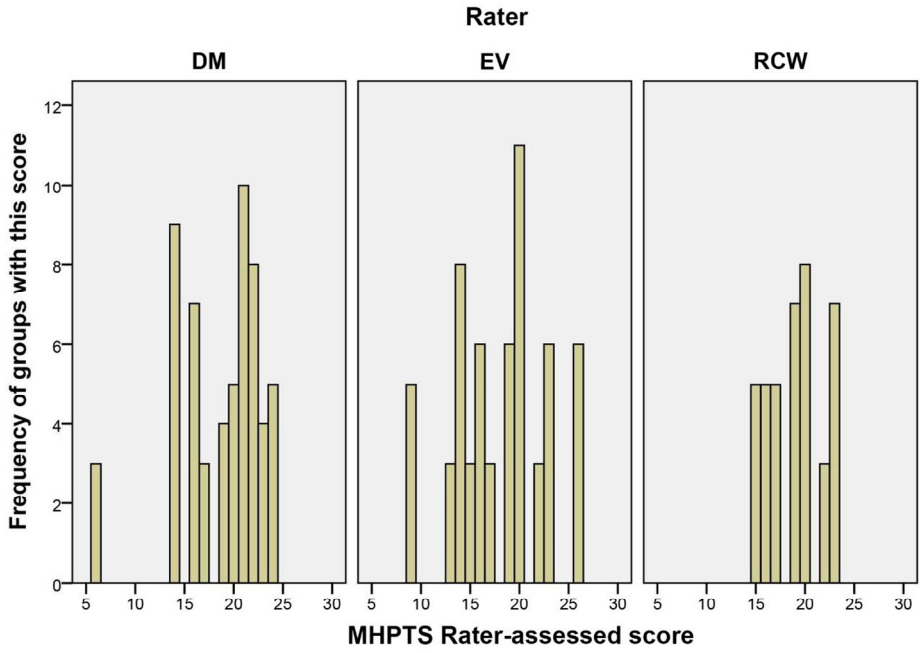
Study design

165x168mm (300 x 300 DPI)



Mayo High Performance Teamwork Scale self-assessed scores

116x89mm (300 x 300 DPI)



Frequency distribution of raters' Mayo High Performance Teamwork Scale scores

117x83mm (300 x 300 DPI)

HREC Ref: # **HC12040**

Observer:_____ **Date:**_____

Session #:____**Table #:**____**Codes:**_____

Task Management

Behaviour	**Yes/No/Other**	**Comments**
Was the task completed?		
Time to complete task (mins:secs)		
Was this within allocated time?		
If not, did team stop at timer?		
Did team plan before starting task?		
Did team use available resources?		
Was workload distributed across team?		
For jigsaw: time to realise pieces missing?		
For jigsaw: time before interacting with other group(s)? Did they initiate?		
For jigsaw: who interacts (Code#)?		
For jigsaw: were interactions cooperative? Competitive?		
For jigsaw: did members assist other groups when completed (code#)?		

Leadership/Followership

Behaviour	Yes/No/Other	Comments
Was there a leader (code#)?		
Was leader selected/default?		
Type of leadership (authoritarian, democratic, laissez-faire?)		
Did leadership change?		
Were roles allocated? (Appointed? Self-appointed?)		
Did everyone participate?		
Were people encouraging (code#)? Discouraging (code#)?		
Was there any brief/debrief/feedback by leader?		
Did some members dominate (code#)?		

Communication

Behaviour	Yes/No/Other	Comments
Did the team share information?		
Did the team use common language?		
Verbal communication? Body language? Both? (code#)s?		
Were team members polite?		

Were some members very vocal (code#)? Quiet (code#)?		
Was the team generally noisy? Quiet? Any laughter?		
Was there conflict?		
If so, how managed?		
Did the team ask questions? Of each other? Outside the team?		
Were some members very vocal (code#)? Quiet (code#)?		

Decision Making

Behaviour	Yes/No/Other	Comments
Were options identified?		
Were decisions made?		
Were decisions implemented?		
Were decisions reviewed?		

Situational Awareness

Behaviour	Yes/No/Other	Comments
Did they appear to be aware of time? Time pressure? Did they monitor time?		
Was the team aware of activities in other		

groups?		
Did the team focus on the task to exclusion of outside information?		
Did the team use information to anticipate (e.g. Changing strategy with impending time pressure)?		

Notes/Other info