Journal of Interprofessional Care

ISSN: 1356-1820 (Print) 1469-9567 (Online) Journal homepage: www.tandfonline.com/journals/ijic20

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To cite this article: Tijmen Geurts, Femke Bekius, Dorien Oostra, Marcel Olde Rikkert, Maud Graff, Minke Nieuwboer & Marieke Perry (18 Mar 2026): A game theoretical framework to identify collaborative behaviour in interactions between allied health and generalist primary care professionals, Journal of Interprofessional Care, DOI: 10.1080/13561820.2026.2641202

To link to this article: https://doi.org/10.1080/13561820.2026.2641202

JOURNAL OF INTERPROFESSIONAL CARE
https://doi.org/10.1080/13561820.2026.2641202

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A game theoretical framework to identify collaborative behaviour in interactions between allied health and generalist primary care professionals

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ABSTRACT

Allied health professionals often are not structurally involved in interprofessional collaboration with generalist primary care professionals for geriatric syndromes. Previously identified facilitators and barriers for interprofessional collaboration are predominantly outside the professionals' sphere of influence. We aimed to identify (in)effective behavioral patterns in interprofessional collaboration between allied health and generalist primary care professionals in older adult care to provide a perspective of action for all professionals to improve the effectiveness of collaboration. We used a combined inductive and deductive approach to thematic analysis on the transcripts of 24 semi-structured individual interviews. To characterize collaborative situations between Dutch allied health and other primary care professionals, we organized open codes into a game theoretical framework. Identified ineffective behavior patterns included using power to overrule allied health expertise, a lack of initiating collaboration, and go-alone behavior in conflicts. Initiating behavior, making expertise more explicit, involving a third-party professional, and compromising were identified as effective behavior. Balancing power and expertise and engaging third-party professionals in situations of conflicting preferences, expertise, or power levels potentially improves generalist-allied health collaboration. The game theoretical framework proved useful in analyzing collaborative interactions and could be an effective strategy to change behavior.

ARTICLE HISTORY
Received 4 March 2025
Revised 27 February 2026
Accepted 28 February 2026

KEYWORDS
Allied health; game theory; interprofessional; primary care

Introduction

An increasing number of frail, home-dwelling older adults deal with multiple problems such as falls, malnutrition, and chronic diseases (Moreland et al., 2020; Zügül et al., 2023). Consequently, multiple primary healthcare professionals often are involved in caring for older adults. Frail older adults benefit most from interprofessional approaches, as they often need multicomponent interventions for their multicausal geriatric syndromes (Boxum et al., 2024). Current primary care for older adults is however predominantly fragmented, leading to many initiatives to improve primary care coordination or continuity (Khatri et al., 2023). One way to achieve improvement is to promote interprofessional collaboration by forming local primary care networks comprising generalist professionals such as physician general practitioners (GPs), primary care nurses, and to a lesser extent, allied health professionals (Oostra et al., 2023). Allied health professionals (e.g. dieticians, occupational- and physiotherapists) have specific geriatric expertise for dealing with common problems such as falls and malnutrition (Lorbergs et al., 2022). Nevertheless, structural collaboration between allied health professionals with specific geriatric expertise and generalist professionals in local primary care networks is uncommon (van Staalduinen et al., 2023). This underlines the need for a better understanding of the dynamics that underly successful collaboration between both groups of professionals. In this paper, we use game theory models to characterize the collaborative dynamics and find patterns of (in)effective behavior.

Background

Previous researchers identified barriers and facilitators of interprofessional collaboration between primary healthcare professionals, such as financial restrictions or a lack of communication infrastructure. Such barriers are also known to impact allied health professionals (Rawlinson et al., 2021). However, these factors do not provide professionals with starting points to improve collaboration and often require organizational or system-level change. Professional behavior however, influences collaboration (Schot et al., 2020; Wei et al., 2020). For example, power differences between individual healthcare professionals can complicate communication, which may impair effective collaboration (Nieuwboer et al.,

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/13561820.2026.2641202

2020; Sutcliffe et al., 2004). Voicing preferences, listening to others, active engagement of other professionals, and validation of their input may be enablers for collaboration (Boltey et al., 2023; Kee et al., 2023). These findings have contributed to the formulation of core competency frameworks for interprofessional collaborative education and practice (Schmitt et al., 2011). However, these frameworks do not address collaboration between allied health and generalist primary care professionals. Therefore, in this study we aimed to identify and characterize (in)effective behavioral patterns in interactions between allied health- and generalist primary care professionals in the care for frail older adults.

Methods

Theoretical framework

To improve interprofessional collaboration, we first identify behavioral patterns in collaboration situations. We studied collaboration between allied health- and other primary care professionals using a game theoretical perspective. Game theory characterizes decision-making situations in which the actions (or behavior) of multiple actors (or professionals in this context) depend upon each other and explains how a combination of actions leads to outcomes in a particular situation (Rasmusen, 2007). Collaboration between healthcare professionals is a dynamic process that occurs between people with varying backgrounds, views, expertise, and roles. Behavior is an important aspect of interprofessional collaboration, but professionals are not always aware of their (un)desired behavior and its implications. Using game theoretical concepts (further abbreviated as "games") to structure collaborative situations creates insight into the different behaviors, their interdependencies, and the implications of these behaviors for the professionals and patients involved. Furthermore, reflecting on collaboration with games offers possibilities for interprofessional education interventions (Bekius & Gomes, 2023; Schmitt et al., 2011; Vreugdenhil et al., 2022). This application of games may provide healthcare professionals with starting points to improve collaboration by focusing on relevant competencies for allied health collaboration (Bekius & Gomes, 2023).

Although many research and practice-oriented games have been described in game theory literature, not all are expected to resonate in everyday primary health care (Bekius et al., 2022). We selected three games relevant for the interprofessional primary healthcare setting based on consensus of all authors (including a GP, community nurse, occupational therapist, geriatrician, a PhD candidate, a postdoctoral researcher in primary geriatric care, a game theory expert), and conformation by the study's steering group (two dieticians, a physiotherapist, older person representatives, another GP, occupational therapist, and community nurse). These three games were selected from seven distinct games previously created and applied (Bekius et al., 2022) to cover a diverse set to best simulate the complexity of real-world healthcare decision-making (Bekius & Meijer, 2020).

Volunteer's dilemma (VD-game)

The VD-game represents a situation where one or multiple actors face a dilemma of taking action (e.g., to volunteer to prevent a worst-case scenario or wait for someone else to take action (Diekmann, 1985)). Taking action means an investment of time and effort, although primary care professionals often are under high time pressure and lack financial resources to act. This makes it beneficial to wait and see whether someone else initiates (wait-and-see behavior), at the cost of having a potential undesired outcome when no one acts. In the care for frail older adults, a VD-game could be an unattended health problem such as an increased fall risk that could eventually lead to crisis situations, such as hospitalization (Fleming & Brayne, 2008). This example underlines the need for taking initiative to prevent such a bad outcome. However, primary care professionals' increasing workload could incentivize wait-and-see behavior when responsibilities are shared among multiple professionals.

Principal-agent game (P-A-game)

The P-A-game is characterized by two key aspects: a hierarchical relationship between a principal (P) and an agent (A) and asymmetry of information. The principal has the power but is dependent on the agent's expertise. The agent, in turn, is dependent on the principal's power in decision-making (Bekius & Meijer, 2020). Due to the GP's professional authority over other primary healthcare professionals in medical decision-making, aspects of the P-A game are likely present in primary care situations where the GP acts as the principal. Expertise asymmetry might occur in some circumstances due to GPs lacking specific allied health geriatric expertise.

Battle of the sexes (BS-game)

The BS-game describes two actors with the same overarching goal (often achieving the highest quality of care in this context) but different incentives and preferences toward actions. In the classic example, one actor has to adapt to the other actor's ideas to reach a decision (Rasmusen, 2007). Allied health- and generalist professionals have differences in perspectives, as each discipline has its area of expertise. The complexity of older adult care may further contribute to disagreements arising between allied health and generalist professionals. Overlapping or diffuse responsibilities and differing preferences of professionals could lead to discussions regarding task distribution or care alignment.

Study design

We performed a qualitative interview study using thematic analysis in a combined inductive and deductive approach (Braun & Clarke, 2020). Inductive coding provided relevant information on the intrinsic or contextual factors influencing identified behavior, while deductive coding of game theoretical elements was applied to identify patterns in this behavior. The Consolidated Criteria for Reporting Qualitative Research (COREQ; *online supplement A*) was used as a guideline for reporting our study (Tong et al., 2007). The study protocol was reviewed by the local ethical committee, who declared that formal judgment was not required according to Dutch law (protocol number: 2023-16266).

Population and setting

The study was conducted in the Dutch primary care context. In the Netherlands, GPs act as gatekeepers, generally being the first point of contact for older adults. Practice nurses work in general practices, supporting GPs by independently consulting patients. Community nurses provide day-to-day care at home and operate from different organizations in the same neighborhood. Furthermore, allied health and generalist professionals often work in relative isolation from each other, and competition between practices is common (Shmueli et al., 2015). We included GPs, practice nurses, community nurses, physiotherapists, occupational therapists, and dieticians using purposive sampling until new interview data did not lead to the identification of any new patterns. Purposive sampling was done for variation in age, gender, work experience, activity in a local primary care network and the urbanization level of the catchment area (Moser & Korstjens, 2018). This sampling method was chosen to allow inclusion of a wide variety of perspectives and equal representation of both allied health and generalist primary care professionals. We started with open invitations through newsletters and e-mails and focused on ensuring a varied study population as more participants were included. We recruited allied health professionals through newsletters of nationwide professional associations, and included allied and generalist professionals who participated in a regional project on integrated older adult care networks via e-mail and subsequent telephone conversations (Oostra et al., 2023).

Data collection

Semi-structured asymmetric individual interviews with professionals were conducted from March until November 2023 by the trained male primary researcher (TG). Interviews were held at the research institute, the work site of the healthcare professionals, or online. Participants were informed that the main purpose of the interview was to explore factors influencing collaboration between allied health and generalist primary care professionals. Informed consent was requested before the start of the interview. The interview guide was pilot tested on two independent professionals before the start of data collection. Pilot data were not included in the analyses. The guide focused on collaboration or interactions with allied health professionals when interviewing GPs or nurses and vice versa. Topics included positive and negative experiences with collaboration and the participants' views on other professionals, such as their added value and approachability. We also added three questions alluding to the three games without explicitly mentioning them (see *Theoretical Framework* section and *Online Supplement B*). Participants were asked to provide concrete examples of their collaborative experiences. No relationship between the interviewer and the participants had occurred prior to study commencement. Interviews averaged 45 minutes. The interviews were audio recorded and transcribed verbatim. Transcripts were not returned to participants for review.

Analyses

In the process of combined inductive and deductive thematic analysis, we performed the following four steps:

(1) In parallel with data collection, transcripts were inductively coded on intrinsic factors, including motivations for behavior, contextual factors that influence collaboration between allied health and generalist primary care professionals, and implications of behavior. Inductive coding was used to keep the possibility open to enrich the game theoretical framework and adapt it to the primary healthcare context. The primary researcher and first author who carried out the interviews (TG) and an experienced qualitative research assistant coded five transcripts independently. Afterward, differences were discussed until an agreement was reached.
(2) Elements of the three games were deductively coded using an existing codebook (*Online Supplement C)*. The codebook includes codes on the games' context, actions (behavior) and outcomes. The coding led to the identification of game elements in collaborative situations present in the transcripts. Deductive coding was done by TG and a game theory expert (FB). Deductive coding was done independently for five transcripts, and discrepancies were discussed until agreement was reached. The remaining transcripts were coded by the primary researcher and discussed with FB in case of doubt. Analysis was facilitated by Atlas.ti version 23.1.1 (ATLAS.ti., 2023).
(3) Coded game theoretical elements (context, actors, actions, outcomes) and accompanying contextual codes and implications from one collaborative situation were characterized as VD, P-A, or BS-games (TG and FB). Situations were only characterized if the actions and either the outcome or implication were coded. Outcomes were also included in the characterization when they were not explicitly mentioned in the transcript but easily deductible from the actions and implications.
(4) Collaborative situations were grouped into clusters during three sessions. Collaborative situations were either added into a cluster based on recurring game-specific context or behavior, or excluded in case of insufficient detail. In the first session, TG and FB participated; in the second and third session they were joined by an experienced qualitative researcher (DO) and an expert qualitative researcher (MP) to finalize the clusters and discuss any last cases of doubt. This resulted in a visual representation for each game. Finally, overarching effective and ineffective behavioral patterns were identified based on whether the implications for professionals or the patient were positive or negative. Member checking with participants did not took place.

Our team consisted of researchers with qualitative, game theoretical (FB), and clinical experience (MP) to ensure a diverse range of perspectives included in data analysis (investigator triangulation).

Results

We conducted 24 interviews with a heterogenous sample of 12 allied health professionals and 12 generalist primary care professionals. An overview of participant characteristics can be found in Table 1.

Inductive coding led to a total of 93 codes on intrinsic or contextual factors and 10 codes on implications. We identified 12 behavioral patterns specific for the primary healthcare context. This enriched the game theoretical framework in its applicability to the healthcare context. In Figure 1 we first present the grouping of individual collaborative situations for each of the three games. Next, overarching behavioral patterns are discussed per game using specific examples from the interviews.

Grouping of collaborative situations

We identified 78 examples of collaborative situations in which one of the predefined games was observed. For each game, we found that collaborative situations between allied health- and generalist primary care professionals could be grouped along two axes. This led to a categorization of collaborative situations into four different quadrants based on recurring behavioral patterns per game.

Volunteer's dilemma (VD-game)

For the VD-game, situations could be grouped based on the prominent action performed by professionals and the level at which these actions took place. One axis indicated whether or not initiating collaboration is the prominent action, and the other indicated whether these actions concerned care for a patient or not (Patient-level) or overarching collaboration (Professional-level) (Figure 1(a)).

Principal-agent game (P-A-game)

For the P-A-game, the GP acted as the principal in all situations, and allied health professionals acted as the agent. One axis displayed whether the situation is characterized by direct contact between principal and agent or by indirect contact via another actor. The other axis indicated whether the principal mainly uses either his power or the agent's expertise during decision-making (Figure 1(b)).

Battle of the sexes (BS-game)

For the BS-game, situations could be grouped based on the interacting actions of the involved healthcare professionals. One axis indicated whether the situation is collaborative or conflict-inducing in nature. The other determined whether the actors were taking shared actions or separate actions (Figure 1(c)).

Overarching behavioural patterns

This section describes the overarching (in)effective behavioral patterns per game in each quadrant, indicated by the letters A,B, C, and D respectively. Behavioral patterns were substantiated using examples of collaborative situations derived from the interview transcripts of participants, which are presented in italics. Finally, inductively coded factors and implications that enriched the framework were included in the narrative of the different games.

VD-game

Ineffective patterns in the VD-game involved situations in which allied health or generalist professionals did not initiate collaboration with other professionals. Effective behavioral patterns included both allied health and generalist professionals showing initiating behavior, either in engagement with the patient or in a primary care network (professional-level; Figure 2) .

A:Patient-level situations in which collaboration was *not initiated* mostly included allied health professionals who were not involved when patients could have benefitted from their expertise:

A dietician (**P3**) was not engaged in the care for a patient with cancer until the patient was too weak to eat. As a result, the patient was unable to benefit from dietary intervention to regain some strength.

Table 1. Characteristics of allied health and generalist interview participants.

Number of participants	Allied health (*n = 12*)	Generalist (*n = 12*)
Sex, n		
Male:	1	3
Female:	11	9
Age (years)		
Median:	51	44.5
Range:	25–66	29–60
Work experience (years)		
Median:	18.5	16.5
Range:	4–32	3–30
Discipline, n		
Physiotherapist:	4	
Occupational Therapist:	4	
Dietician:	4	
General Practitioner:		3
Practice Nurse:		2
Community Nurse:		7
Network participation, n		
Yes:	6	9
No:	6	3
Urbanization level of catchment area, n	4	6
Rural:	8	6
Urban:		

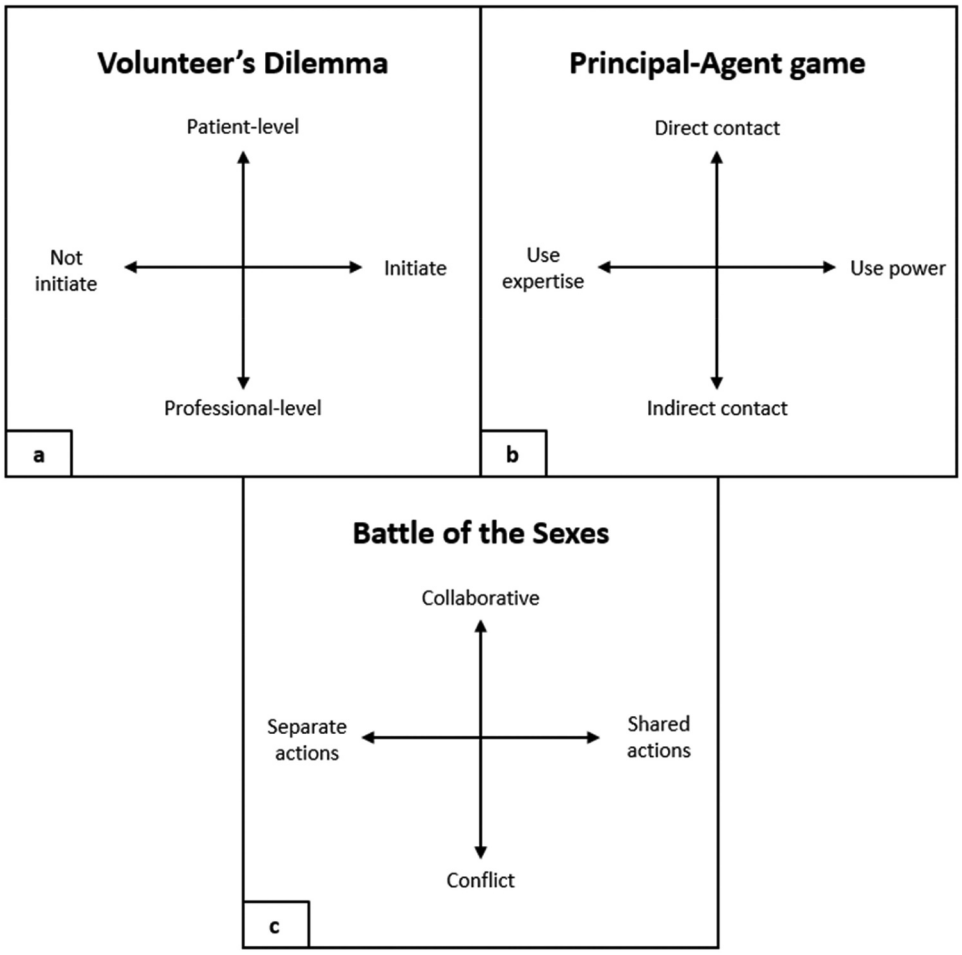
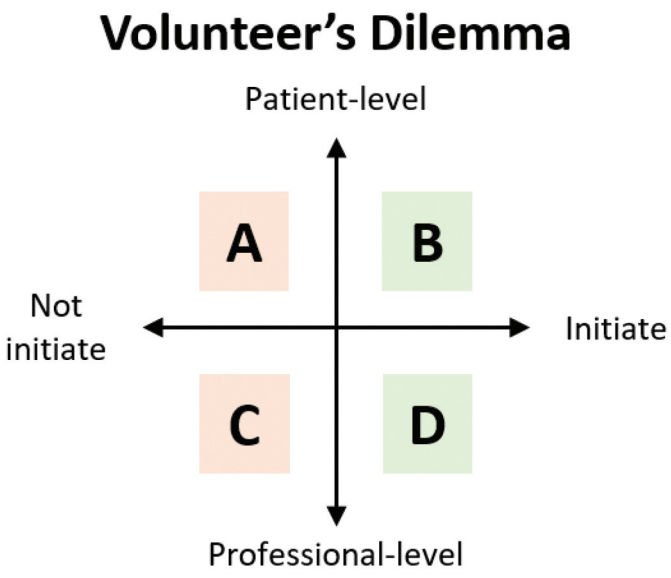


Figure 1. A graphical representation of the grouping process. Situations could be grouped along two axes for each of the games: 1a. The Volunteer's dilemma; 1b. The principal-agent game; 1c. The battle of the Sexes.



Allied health professionals noticed that generalist professionals did not always know when they can be of use. Workload, as well as the feeling of having to tackle problems yourself were mentioned by allied health professionals as possible factors that led to non-initiating behavior in generalist professionals.

B:*Initiating* situations at the patient level mostly included situations in which healthcare professionals volunteered by initiating collaboration with allied health professionals in specific patient care cases.

A community nurse (**P21**) mentioned that her knowledge of occupational therapist's expertise helped with referrals. When a patient received compression stockings, the occupational therapist was actively engaged to assess the patient's level of independence.

Early engagement of allied health professionals was considered positive for the patient by all professionals as this helped to shift toward preventive care. Knowledge of allied health disciplines and applying a broad perspective were important factors to initiate collaboration with allied health professionals.

C:Situations concerning multiple professionals in a network with *non-initiating* behavior encompassed those that were characterized as a lack of initiation of collaboration (wait-and-see behavior):

A GP (**P15**) acted as a leader in a care network, and other care professionals demonstrated wait-and-see behavior. The GP needed to invest time in activating the other network members. She mentioned that workload and a lack of

stimulation from the allied health practice or organization might enhance waiting behavior in networks.

Allied health professionals may decide not to join a network as it was seen as too disease-specific or slow-acting to justify the invested time in addition to their already existing workload.

D:*Initiating* situations on the professional-level were mostly about the dilemma between the limitations of the system and the importance of collaborating with other professionals:

A GP (**P14**) actively stimulated allied health involvement by giving allied health professionals a say in network matters. She mentioned that allied health professionals were now more engaged due to their responsibility. This countered wait-and-see behavior in the network due to workload and workforce changes.

In these situations, someone took the initiative to stimulate allied health activity in a network by asking for their input when allied health-related topics are discussed. This form of responsibility-sharing was seen as beneficial for the collaboration. All interviewees mentioned that this helped older adults to live at home for a longer amount of time. Allied health professionals also noted that they were motivated by their perceived benefit of initiating collaboration for patient care.

P-A-game

Ineffective patterns in the P-A-game involved situations in which the GP's power position was leading in decision-making. Effective behavior included situations in which the GP used the expertise of allied health professionals directly or through an intermediary (Figure 3).

A:When the GP*s power was leading* in direct contact situations, allied health professionals reported a feeling of their expertise not being recognized and experiencing no room for discussion or collaboration. These situations could damage the professional relationship and led to the allied health professional seeking other collaboration partners. GPs indicated that they sometimes believed like they were not taken seriously as well:

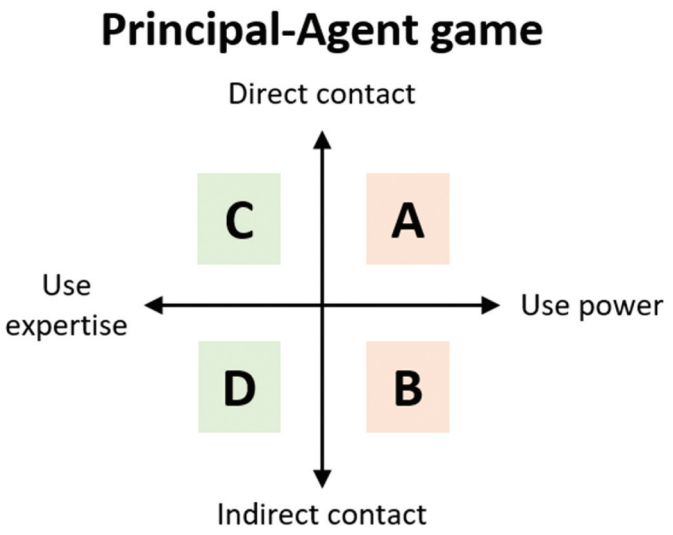


Figure 3. (In)effective patterns in the principal- agent game. Green indicates that effective behavior is predominantly present in the quadrant, red indicates predominant ineffective behavior.

A GP (**P15**) mentioned how a physiotherapist recommended an ultrasound to a patient. The GP considered the ultrasound redundant and was surprised that the physiotherapist did not discuss the matter with her beforehand. Instead, the GP was informed afterward. As a result, she had to convince the patient that the ultrasound will not provide further insights.

In these situations, GPs described that they have used power to overturn a decision made by allied health professionals who had not first consulted the GP.

B:Indirect contact could be a consequence of the GP *using power* to maintain distant relations with allied health professionals:

An occupational therapist (**P6**) had trouble contacting a GP and mentioned that the GP was generally uninterested in participation with projects discussed in a local network. This led to the occupational therapist opting to contact a community nurse instead.

GPs mentioned that direct contact was not always necessary, and referral letters were enough. Situations mentioned by allied health professionals were usually about difficult communication due to GPs behaving distantly. Allied health professionals mentioned that they perceived great variety between GPs in terms of involvement or interest in collaborative initiatives such as participation in a care network.

C:Direct contact situations between the GP and an allied health professional usually led to satisfaction with collaboration among both groups when the GP *used the expertise* of the allied health professional:

An occupational therapist (**P5**) described that she often had more expertise than GPs on a shared patient's independence and daily functioning. She added that when GPs valued this information, she was stimulated to keep sharing her expertise.

Both GPs and allied health professionals mentioned benefits for patients due to prevention and better care alignment. In general, several GPs pointed out the importance of recognizing allied health' expertise and its value in building trust.

D:When the GP *used expertise* from the allied health professional in indirect situations, contact between GP and allied health professionals was indirect through the involvement of a practice nurse as an intermediary:

A physiotherapist (**P11**) mentioned that GPs are hard to reach, so she decided to contact the practice nurses. The physiotherapist preferred a practice nurse who specialized in older adult care, enabling an efficient intermediary role.

Allied health professionals mentioned that they were satisfied collaborating with the practice nurse, as it was time efficient and still allowed allied health professionals to inform the GP indirectly.

BS-game

An ineffective pattern in the BS-game involved conflict situations in which professionals lacked care alignment. Effective behavior included situations in which professionals made a shared decision to involve a referee or came to a collective compromise. Professionals adapting to the preference of others during collaboration could be both effective or ineffective (Figure 4).

A:In conflict situations with *separate* actions, either allied health or generalist professionals showed go-alone behavior,

unconsciously or deliberately choosing their own path. From an allied health perspective, these situations mainly were about community nurses taking action without consulting with an allied health professional:

An occupational therapist (**P8**) wished she was involved when nurses were arranging a wheelchair for a patient. The wrong wheelchair was chosen, which led to the occupational therapist being contacted later anyhow when problems arose.

Community nurses mentioned situations in which allied health professionals did not inform nurses about the progress of allied health treatment. These situations led to time loss as nurses had to collect information themselves, sometimes relying on the patient for information. Other situations mentioned by nurses concern allied health professionals overtreating patients, which led to more work for nurses that they sometimes saw as unnecessary. A lack of care alignment characterized all situations.

B:In collaborative situations with *separate* actions, one professional adapted and agreed with the decision of the other(s):

A practice nurse (**P17**) decided to help a dietician find some patients for a project, even though not all details were known to her. The nurse was well acquainted with the dietician, having worked together for many years, which made it easier to go along with the dietician's request.

Familiarity and trust were regarded as important for adapting to the other professional. These situations were considered beneficial for the care process. Other situations concerned choices made in a care network. In these situations, allied health professionals believed they had to defer to the majority who preferred not to focus on allied health topics, arguing that other professionals would only focus on allied health topics once they perceived the benefit.

C:In collaborative situations with *shared actions*, allied health and generalist care professionals often found a compromise:

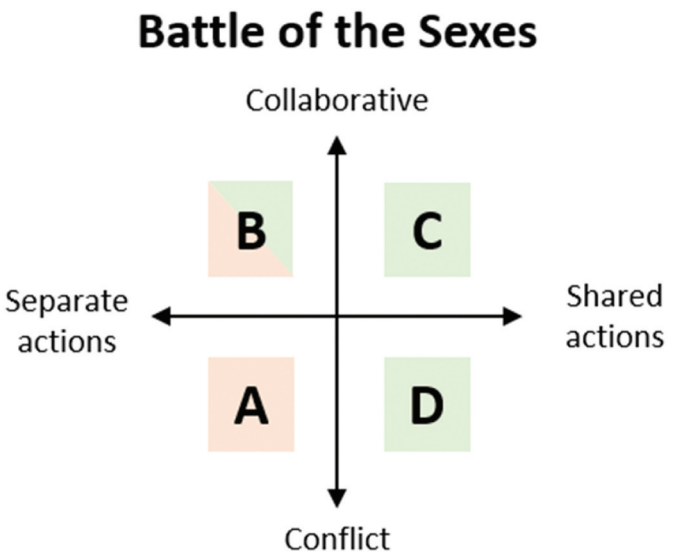


Figure 4. (In)effective patterns in the battle of the sexes. Green indicates that effective behavior is predominantly present in the quadrant, red indicates predominant ineffective behavior. In the red-green quadrant, both are equally present.

A physiotherapist and a community nurse (**P18**) had different preferences regarding the installation of an anti-skid mat for fall prevention. The nurse believed that the patient should decide. In the end, alternative measures like removing a dangerous bath mat were undertaken as a compromise between professionals and the patient.

Both allied health and generalist care professionals were satisfied with how these situations played out and felt like they often led to well-aligned care. Clear, open communication was regularly mentioned as key for reaching a compromise.

D:In this quadrant, a *shared decision* was made to involve an independent actor as a referee during a conflict:

A GP was called in to act as an independent third party during a conflict between a dietician and a speech therapist about starting a food swallowing intervention. According to the dietician (**P3**), the GP's intervention helped make the right decision, and the more careful approach was chosen due to the patient's aphasia.

Note that initially, the conflict appeared between two allied health professionals. However, the position of the GP as a voice of authority was used to resolve the conflict. Thereby, this became a situation in which a generalist and allied health professional disagreed.

Discussion

We identified (in)effective behavioral patterns in collaborative situations between allied health and generalist primary care professionals. These results contribute to current literature by focusing on behavior of professionals involved in collaboration instead of system-level facilitators and barriers for collaboration. Therefore, this study provides allied health and generalist primary care professionals with insights and suggestions to improve their collaboration themselves. We will discuss the identified behavioral patterns below.

First, we identified GP's power leading in the decision without including valuable expertise as ineffective, as it could potentially damage the working relationship, causing allied health professionals to look for other care partners. In addition, allied health expertise can be crucial for decision-making, but this is underutilized by GPs in situations where power is leading. GPs possess power resulting from their position of final responsibility for patients. However, allied health professionals are often used to leading their own primary care practice and could be unfamiliar with being overruled by the GPs power. Alternatively, GPs sometimes overturn decisions that allied health professionals make without first consulting with GPs. Professionals were more satisfied and mentioned improved care alignment in situations where allied health expertise was used more. Thus, it may be important to develop interprofessional competencies such as active listening for all professionals involved in situations with power and information asymmetries.

Second, an ineffective pattern is allied health professionals or generalists showing go-alone behavior. Going-alone can negatively impact the professional relationship between allied health and other professionals. Consequences for patient care due to go-alone behavior have previously been described and underline the danger of poor communication during conflicts

(Cullati et al., 2019). Trust is mentioned as essential, allowing openness toward the other professional's ideas and fully going along with it, resulting in the second effective pattern. Repeated interactions are necessary to build trust (Sutherland et al., 2022), which suggests that compromising might be the more favorable behavioral strategy when collaborating professionals are still getting to know each other. Thus, conflict management, team reasoning, and communication competencies can be developed to promote effective behavior.

Third, we identified an effective pattern that could help circumvent the ineffective patterns described above: engaging a third-party professional. A practice nurse could be involved as an intermediary between allied health professionals and GPs when an ineffective power pattern is present. Previous researchers have mentioned the practice nurse's role as a connector in collaborative care (Phillips et al., 2009). However, the potential benefits of this intermediary role in situations with power asymmetry are not yet substantiated. We found that involving a third actor may help mediate a conflict between professionals, which demonstrates that using power in decision-making can be more constructive.

Finally, our study showed that due to non-initiating behavior, allied health professionals are often not engaged, and collaboration does not occur. This could be detrimental for patients who do not receive the benefits of preventive allied healthcare. Our findings suggest that clarifying roles and responsibilities is an important core competency (Schmitt et al., 2011) that can facilitate a shift toward initiating behavior. In our study, allied health professionals suggested that generalist professionals sometimes exhibit patient ownership, or may not initiate contact due to a lack of understanding of allied health roles, echoing previous findings (De Coninck et al., 2023). We observed more conscious wait-and-see behavior by allied health professionals in networks. Literature suggests that the facilitation of shared leadership (e.g. a generalist and an allied health professional leading together) contributes to effective collaboration (Schmitt et al., 2011). Our findings add that sharing responsibilities with allied health professionals can cause them to be more active in networks.

In this study, we applied a novel methodology by using a game theoretical framework to investigate collaboration between healthcare professionals in primary care. A game theoretical lens has been used in healthcare studies before. For instance, a former study investigated the dynamic between care continuity and trust in the patient–GP relationship, using theoretical concepts to guide inductive coding (Tarrant et al., 2010). We examined collaborative situations in more detail, as we additionally coded game theoretical elements (context, actions, outcomes, and implications) to examine behavior. In studies from other sectors, such as management and planning, game theory approaches focus more on decision-making processes (Piraveenan, 2019). In these sectors, actors are often more aware of the elements of the game, such as players, actions, and decision outcomes. Our study contributes to the literature on interprofessional collaboration in primary care by using game theory to make subconscious behavioral patterns more explicit. As a result, the methodology and findings provide opportunities for joint reflection and learning by involving professionals in identification of patterns to improve interprofessional collaboration (Bekius et al., 2022; Vreugdenhil et al., 2022).

Strengths and limitations

One major strength of this study is that we applied a novel and innovative game theoretical framework from outside healthcare science to understand collaborative behavior of allied health and generalist primary care professionals. By doing this, we successfully identified (in)effective behavioral patterns in an interprofessional context. This allowed a shift away from identifying well-known facilitators and barriers toward providing professionals with a perspective to improve collaboration themselves. We enhanced our results' trustworthiness by using investigator triangulation through all steps of our data analysis and iteratively reassessing our data. The inclusion of both game theoretical and clinical perspectives in group sessions with the research team strengthened the process of integrating a game theoretical framework in a clinical setting.

Another strength is the use of a purposive sampling approach to include perspectives of a wide range of allied health and generalist primary care professionals partly active in diverse local care networks.

There are also some limitations to consider. First, we did not include the perspective of all professionals involved in the examples interviewees provided. For instance, if a physiotherapist described a collaborative situation with a GP, the GP's viewpoint could not be taken into account as he did not participate. Still, through purposive sampling, we were able to interview a wide variety of professionals describing many situations, which prevented one-sidedness in our data. A second limitation is that we did not return transcripts to participants for review. This would have allowed participants to enrich their description of collaborative situations after the interviews. Finally, we performed this study in the Dutch primary healthcare setting, which may raise some questions about transferability of the results to other countries. For instance, the gatekeeper role of Dutch GPs reinforces their position of power, while in countries with a hospital-based system, allied health professionals are less dependent on referral from GPs, and thus experience those power relations less prominently (Damen et al., 2025).

Implications for research and practice

Increasing professionals' awareness of (in)effective behavior would be a logical first step when translating these results into practice. This could be achieved by applying our findings in reflective workshops with professionals trying to improve their collaboration by shifting toward more effective behavior (Bekius & Gomes, 2023). Joint reflection on behaviors through interactive role-playing or serious gaming may facilitate teams in focusing on improvements rather than on ineffective behaviors. Moreover, it can stimulate acquiring interprofessional competencies such as conflict-management or active listening as part of quality improvement trajectories or interprofessional education. Cultural context is likely to influence which patterns are prominent. For instance, high power distance relationships between professionals are more common in east-

Asian care contexts than in some western countries (Kyynärsalmi et al., 2025). Thus, future interventions should be tailored toward cultural backgrounds and the needs and wishes of the involved professionals. Care organization initiatives may facilitate a shift in behavior by targeting related barriers and facilitators. For example, they can promote trust-building by organizing physical meetings and team activities. In the future, our findings should be verified among a broader representation of professionals, for example through a survey spread among a larger population of primary healthcare professionals. In addition, our methodology could be repeated while exploring other games that may lead to the identification of new (in)effective patterns of behavior.

Conclusion

Using a game theoretical perspective, we identified (in)effective behavioral patterns in collaborative situations involving allied health and generalist primary care professionals. Our results recommend shifting from non-initiating or go-alone behavior toward initiating collaboration and clarifying allied health professionals' roles. Furthermore, allied health professionals' expertise should be more explicitly included in decision-making when there is power asymmetry. Finally, approaching a third-party professional can be considered in situations of conflicting preferences, expertise, or power levels. These findings reveal targets for professionals to improve their interprofessional collaborative competencies and for care organizations to stimulate continuous learning in primary care networks and communities of practice. Our insights derived from the game theoretical framework lend toward interactive workshops in which allied health and other primary care professionals jointly reflect on (in)effective behavior during collaboration.

Acknowledgments

The authors would like to thank all participating professionals. Furthermore, the authors want to thank the NVGF (Dutch Association for Geriatric Physiotherapists), Kenniscentrum Ondervoeding (Dutch knowledge centre for malnutrition) and Ergotherapie Nederland (Occupational Therapy Netherlands) for helping with recruitment. Finally, the authors would like to thank Irma Maassen for her help with data analysis.

Author contributions

CRediT: **Tijmen Geurts:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing; **Femke Bekius:** Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Writing – review & editing; **Dorien Oostra:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing; **Marcel Olde Rikkert:** Project administration, Supervision, Writing – review & editing; **Maud Graff:** Supervision, Writing – review & editing; **Minke Nieuwboer:** Funding acquisition, Project administration, Supervision, Writing – review & editing; **Marieke Perry:** Conceptualization, Formal analysis, Methodology, Project administration, Supervision, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Netherlands Organisation for Health Research and Development (ZonMw), the Netherlands, under Grant [80-86900-98-153].

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Data availability statement

Data consists of interview transcripts in Dutch. Data is available upon reasonable request.

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