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## Utilising dyads in medicines optimisation and illness management research

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## ABSTRACT

There has been much growth in the interest in and use of family-level and dyadic level theories and methodologies to explore the influence of social relationships on health and the influence of health on social relationships. Social relationships include those with romantic partners, friends, siblings, children and care professionals these individuals play a significant role in the physical health, mental health and well-being of a patient. An important part of this includes medicines optimisation and illness management. Studying health and well-being and consideration of both partners in the context of these close social relationships is clearly important in health research; as such both partners become the unit of study – also known as a dyad. The aim of this paper is to provide an introduction and overview as to how dyads might be used in medicines optimisation and illness management research. This aim will be achieved through the following objectives: dyadic study designs used in health research; some of the challenges that can occur in recruitment and data collection and strategies that can be used to overcome them; dyadic data analysis: some methodological and substantive considerations that require consideration when using dyadic data analysis.

## Introduction

There has been much growth in the interest in and use of family-level and dyadic level theories and methodologies to explore the influence of social relationships on health<sup>1–3</sup> and the influence of health on social relationships.<sup>4,5</sup> Social relationships include those with romantic partners, friends, siblings, children and care professionals; these individuals play a significant role in the physical health, mental health and well-being of a patient. An important part of this includes medicines optimisation and illness management. Individuals who occupy these roles may themselves experience changes in their own physical health, mental health and well-being.

Studying health and well-being and consideration of both partners in the context of these close social relationships is clearly important in health research, as such both partners become the unit of study – also known as a dyad. Dyadic research approaches can be utilised in qualitative,<sup>6,7</sup> quantitative<sup>8</sup> and mixed methods studies.<sup>9</sup> Illness experience occurs within the contexts of relationships, as such studies that employ dyadic perspectives are needed. Literature on chronic illness and stages of illness has put a spotlight on the need to study dyads.<sup>10–13</sup> Dyadic approaches can be utilised during recruitment, data collection, data analysis and as an important target for interventions in research and in clinical practice.

Studies that are designed to capture the interdependent complexities of relationships utilising dyads can provide researchers with new and

significant insights that contribute to health outcomes which cannot be fully realised with individualistic study designs. This is evident in studies where outcomes have been studied in dyads compared to individuals.<sup>14</sup> Lyons & Lee<sup>15</sup> put forward that the management of illness is a dyadic phenomenon (this is the core tenet of the Theory Dyadic Illness Management and expounded in their paper.<sup>15</sup> Further,<sup>15</sup> the way in which dyads appraise illness as a unit influences the ways in which they engage in behaviours to manage illness and that there is a bidirectional relationship between this and the 'health' of the dyad (Fig. 1). Research can help elucidate contextual factors that are important in this dyadic illness management e.g., severity of symptoms, age, type of relationship.

This theory is enhanced by the incorporation of these contextual factors that are considered as risks or a protective influences on dyadic appraisal and management behaviours and may be stable or dynamic in their influence over time (Fig. 2). Risk factors are those that contribute to greater incongruence in illness appraisal and less collaboration in dyadic illness management behaviours. Protective factors, on the other hand, are those that impact positively on illness appraisal and more collaborative illness management behaviours. Furthermore, contextual factors are categorised at individual, dyad, family, social or cultural level to represent the various contexts within which the patient and informal carer are situated.

The degree of congruence or incongruence in appraisal of care values and preferences between a patient and their informal carer illustrates

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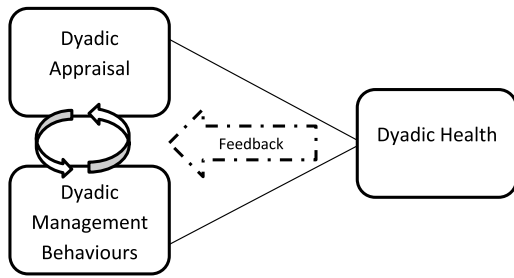


Fig. 1. Central elements of the Theory of Dyadic Illness Management (adapted from Ref. 15).

very clearly the value of exploring the dyadic perspective for both research and clinical practice. For example, in dementia care it is important to ensure that decisions and care planning are made in accordance with wishes and desires of the patient whilst at the same time empowering their informal carer to be able to make those critical decisions when needed.<sup>16</sup> One study found that incongruence for preferences relating to socioemotional care was a predictor of greater relationship strain and worse mood for the patient with dementia., On the other hand, perceived incongruence for preferences relating to socioemotional care was related to worse mood and a lower quality of life for the informal carer.<sup>17</sup>

Although dyadic research is gaining traction and provides important insights into the interdependence of health within dyads and the transactional nature of how each individual influences the others' health there is a distinct lack of evidence regarding medicines optimisation and the health of the dyad as a unit. Conceptualization of dyadic health is relatively new but builds upon the second-order dyadic data described by Thompson and Walker.<sup>8</sup> Identifying dyadic factors that are important in medicines optimisation and health as well as the modifiable individual, dyadic and familial factors associated with optimal versus poor dyadic health has enormous potential to inform how interventions are tailored to the dyad as a unit. Importantly, in a way that is not possible with "one size fits all" or individual approaches.

The aim of this paper is to provide an introduction and overview of the use of dyads in the study of medicines optimisation and illness management research. This aim will be achieved through the following objectives:

To provide an overview of:

- (1) Dyadic study configurations used in health research.
- (2) Some of the challenges that can occur in recruitment and data collection and strategies that can be used to overcome them.
- (3) Dyadic data analysis: qualitative and quantitative approaches.
- (4) Some methodological and substantive considerations that require consideration when using dyadic data analysis.

**(1) Dyadic study configurations used in health research**

There are potentially four different configurations with each individual within the dyad either diagnosed (D) with an illness/disease/ ailment or undiagnosed (U)<sup>18-22</sup>:

- Diagnosed / Undiagnosed (DU) studies: one individual is diagnosed and the other member is undiagnosed;
- Undiagnosed / Undiagnosed (UU) studies: for example, in health prevention or health promotion studies.
- Diagnosed / Diagnosed (DD) studies: for example, the diagnosis is couple-level, e.g., infertility.
- A blend of DU, DD, and UU couples all within the same study, such that one, both, or neither of the members is diagnosed.

The most commonly used configuration is DU, in these studies the individual who is undiagnosed is commonly referred to as an informal carer, caregiver or someone who provides social support. Table 1 provides some examples.

**(2) Some of the challenges that can occur in recruitment and data collection and strategies that can be used to overcome them**

Although dyadic research is a significant approach to achieve perspectives on relationships, it is accompanied by a unique set of methodological challenges. These challenges centre around recruitment, retention, and data collection.<sup>23-26</sup> Thoughtful study design and planning ahead can help overcome many of these. For example, considering sensitivities around the use of the terms 'carer' or 'caregiver' when asking the patient to identify someone to participate in a study. A patient could instead be asked to identify someone who is not a care professional who provides a significant amount of support for them.

Consideration and monitoring for informal carer burden when planning the intervention and data collection scheme; including measures of informal carer burden as a study outcome can be useful here. Eligibility criteria for informal carers must be clearly thought through, clearly defining the dyad-specific protocol as criteria might limit the participation of the informal carer and prevent completion of the study protocol of studies applying these dyadic configurations. Finally, during budget planning the need to provide clear and separate incentives for informal carer depending on the extent of participation in the study is important. Table 2 provides more detail.

**(3) Dyadic data analysis**

Methods used to analyse data will depend on whether the study is qualitative or quantitative, and, therefore driven by how the data is collected. For example, in qualitative studies if separate interviews are

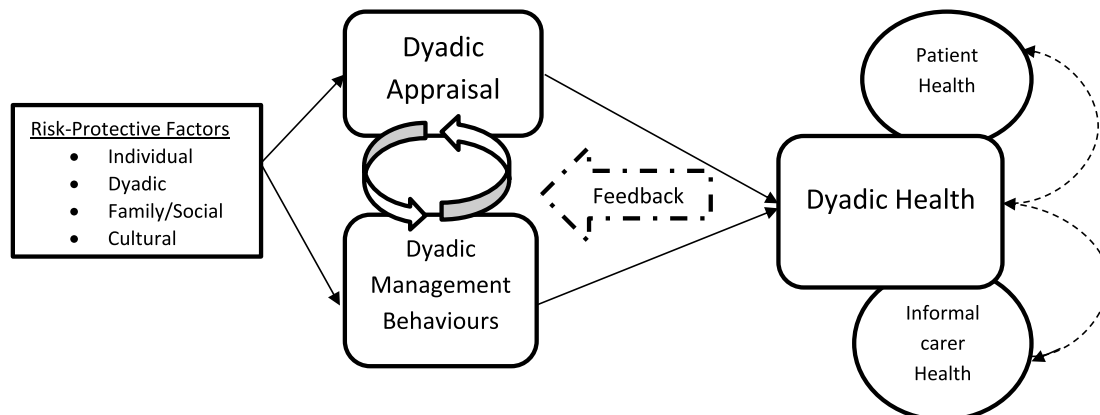


Fig. 2. Theory of Dyadic Illness Management with predictors (caregiver = informal carer) (adapted from Ref. 15).

**Table 1**  
Dyadic study configurations – examples.

Design – dyad	Type of study	Example
Diagnosed/Undiagnosed (DU)	Quantitative	To examine the influence of racial/ethnic concordance between participants and research staff on respiratory study attrition <sup>19</sup> USA 509 dyads Data were pooled from participants and clinical research coordinators in six longitudinal studies of respiratory illness. Multilevel modelling examined the effect of racial/ethnic concordance on attrition at the first and one-year follow-ups. Reported that Spanish language, lower education, and greater depressive symptoms predicted greater attrition, but these effects disappeared in adjusted models. Race/ethnicity, age, gender and health literacy did not predict attrition. Contrary to hypotheses, attrition was greater among concordant than discordant dyads: Attrition was almost five times greater at first follow-up for Black and Hispanic participants in concordant dyads, and almost four times greater at one year.
Undiagnosed/Undiagnosed (UU)	Quantitative	To assess the role of adolescent romantic partners on the expression of health behaviour <sup>20</sup> USA 80 romantic dyads A longitudinal multilevel analysis was conducted Concluded that partner similarity and partner influence with the majority of health-harming behaviours exists. Specifically, partner influence was evident for smoking and alcohol use with partner influence approaching significance for marijuana use. Limited evidence was found for partner similarity and partner influence for health-protective behaviours.
Diagnosed/Diagnosed (DD) There is a paucity of data using this approach	Quantitative	Explore the transmission of depressive symptoms among spouses undergoing assisted reproduction treatment <sup>21</sup> Germany In 82 romantic dyads Both partners' stress appraisals and depressive symptoms were assessed at three measurement points throughout assisted-reproduction treatment. Findings indicated positive transmission effects of depressive symptoms from men to women across both measurement intervals. A positive transmission effect of stress appraisals from men to women was observed from

**Table 1 (continued)**

Design – dyad	Type of study	Example
A blend of DU, DD, and UU couples all within the same study, such that one, both, or neither of the members is diagnosed.	Quantitative	before until after the pregnancy test. Women's stress appraisals mediated part of the transmission of depressive symptoms from men to women. Men's stress appraisals, however, were unrelated to women's earlier depressive symptoms. Men's earlier depressive symptoms might have operated as cues for women's adjustment of their own stress appraisals, which then predicted women's increased depressive symptoms Weight status and weight concerns were examined <sup>22</sup> USA 208 romantic dyads Results indicated that participants' weight concerns were associated with their weight status. Men and women who were relatively heavy and who had relatively thin romantic partners were most likely to express weight concerns.

undertaken then data analysis will involve a process of comparing and contrasting data obtained from each individual to identify contrasts and overlaps. With regards quantitative approaches there are three main methods of data analysis used, Actor-Partner Interdependence Model, One-with-many design and Social Relations Model.

### Qualitative

In the first instance, analysis of data is similar to that undertaken in studies involving individuals, for example using thematic analysis or a grounded theory approach.

What is unique to dyadic data analysis is the identification of themes. This is performed by comparing and contrasting data obtained from each individual to identify contrasts and overlaps. Analysis of data in this way can lead to reconstruction of existing themes and generation of new themes. Eiskovits & Koren<sup>27</sup> provide an excellent review. Perspectives which occur as a result of comparing and contrasting views of each individual within the dyad allows light to be shed on particular issues such as the impact of the dynamic of the relationship on health, as such this dyadic version generates something that is greater than the sum of the two individual parts.<sup>27</sup> This dyadic version is one that is produced by the researcher whilst simultaneously keeping individuals' data intact.

Qualitative interviews can be undertaken in a variety of different ways:

- separate (individual) interviews
- separate interviews performed simultaneously by different interviewers.
- joint interviews
- both separate and joint interviews with same individuals
- separate interviews with some informants and joint interviews with others.

Although interviews are specified here, this might equally apply to the use of other qualitative approaches e.g., observation, document studies such as personal diaries.

**Table 2**  
Some of the challenges that can occur in recruitment and data collection and strategies that can be used to overcome them.<sup>23</sup>

	Potential challenges	Possible strategies
<b>Recruitment and sampling</b> Dyads can be accessed from many settings: e. g. secondary care (inpatient, outpatient), primary care (GP, clinics). Each setting requires carefully developed recruitment strategies	<b>Terminology</b> Patients may be reluctant to acknowledge the need for informal carers and may not think of family members or persons helping them as informal carers or caregivers. Individuals who are informal carers may not see themselves in this role.	Asking the patient to identify the person - spending the most time with them  - providing the most support or care for them - which family member they discuss their health concerns with most of the time - whom they turn for assistance with symptom management These are suggested examples, the decision as to how this is phrased will ultimately be driven by the need to identify of the most appropriate informal carer for the study.
	<b>Approach to recruitment – who to recruit first</b> Informal carer may be recruited via the patient or vice-versa or both. In other words, recruit the patient first and then recruit the informal carer via them or recruit the informal carer and then recruit the patient via them. This may depend on, for example, the setting.	Be clear in recruitment strategies which approach has been chosen taking into account contextual factors such as setting. Using both approaches may maximise the number of dyads recruited.
	<b>Approach to recruitment – method</b> Recruitment using postal methods only has been shown to yield varying results <sup>24</sup>	Combine different methods e.g. face-to-face contact followed up by a phone call. <sup>25</sup> A phone call will also provide an opportunity to discuss the study in more detail and answer any questions.
	<b>Attrition of either member of the dyad due to details of study not being clear</b> Reliance on either member of the dyad to explain the purpose and expected involvement may not be effective	Develop materials and strategies to ensure each member of the dyad clearly understands the study e.g. ‘script’ for telephone call, easy to read leaflet (using lay language). This material should also explain why the involvement of both individuals is helpful.
	<b>Timing of recruitment</b> Each individual may have their own commitments that may need accommodating (e.g. other caring responsibilities).	Asking about when might be an appropriate time for either or both to be involved will help the patient and their informal carer plan and be prepared and will minimise the risk of attrition.
	<b>Eligibility criteria for informal carers</b>	Being flexible and accommodating in your approach. Specific and clear eligibility criteria must be

**Table 2 (continued)**

	Potential challenges	Possible strategies
	Criteria might limit the participation of the informal carer and prevent completion of the study protocol. On the other hand the protocol may necessitate recruiting dyads where both individuals have an illness.	stated in the research protocol. This may depend on the study aims and objectives.
	<b>Participation may be dependent on discussion between individuals within the dyad</b> Even if one individual is interested in participating they may not be willing to agree until they have the opportunity to discuss the study with the other member of the dyad and obtained their agreement.	Obtain permission from one individual within the dyad then calling the other individual and explain the study to them. Accommodate for potential refusals e.g. time, resources
	In addition, patients may be reluctant to ask informal carers to participate if they feel that individual is already doing too much for them and participating in the study may be seen as another burden.	
	<b>Both individuals have the same diagnosis</b> During the recruitment process it may be found that both individuals have the same diagnosis.	This may serve as part of the exclusion criteria (see above). Develop clear guidance ahead of study commencement to accommodate for this e.g. the individual who has been most recently diagnosed will be assigned as the patient. Alternatively randomly select one individual from the dyad who will be assigned as the patient.
	<b>Sample size</b> Consider the statistical power needed to answer the research question taking into account the potential attrition of either or both individuals	Estimation of sample size must be based on patient and informal carer attrition rates described in the existing literature or obtained in preliminary studies.
	<b>Each member of the dyad</b> Individual separate written consent forms will be required for each member of the dyad.	Seek advice from your ethics committees and research teams for further details
	<b>Consent forms – content</b> Important to reduce family members’ perceptions of coercion to participate.	Consent forms need to include comment that indicates that the data will be used together. Informal carers are not receiving care, so the language in the consent needs to indicate that, if the family member declines, the patient will still receive all entitled care
	<b>Retention</b> Personal contact and development of a good rapport between the researcher and	During the first conversation allow each participant an opportunity to share concerns about the study
	<b>Effective communication skills</b>	

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Table 2 (continued)

	Potential challenges	Possible strategies
participant have been identified as crucial strategies for recruitment and retention into any study <sup>26</sup>	Each individual within the dyad may have their own and different concerns about the study. They must be in an environment that they feel comfortable in and may express to do this with the other member of the dyad or separately or both.	or about his or her own life situation facilitates trust They may want to do this at their own home rather than in a healthcare setting If this is done at their own home then, take care to ensure privacy is observed if they express concern e.g. other member of the dyad within earshot. If the patient drops out, and continuing to follow the informal carer will not contribute to the study aims, the research staff can thank the informal carer for his or her contribution and time thus far and provide any incentive e.g. gift voucher due the person. Depending on the questionnaires used in the study, the researcher can also explain that it might be difficult to respond to the study questions because the situation with the original dyad has changed.
<b>Attrition</b> Careful tracking is required.	<b>One member of the dyad may want to drop out</b> Plans and decisions need to made well in advance at the start of the study as how this will be dealt with e.g. will the patient or informal carer continue in the study if the other dyad member drops out?  The decision should be based on the potential contributions of the retained individual from the dyad to the knowledge development, study results, and available study resources Including an 'incomplete dyad' in the study can add costs, unless the data collected are useful.	Whether or not the data collection takes place together or separately will be driven by the underlying purpose, framework, and study design. However, consider how this might affect the quality and accuracy of the data and incorporate that into the final decision. Depending on the study and if the protocol allows then participants may be asked to give express their preference But bear in mind this could introduce a bias in responses due to one individual exerting an influence on the other individual's responses. If the data collection occurs at home then separate rooms out of earshot of others may be
<b>Data collection and delivery of study intervention</b>	<b>Collection of data – together, separately or both</b> This will influence the proximity of participants to each other	

Table 2 (continued)

	Potential challenges	Possible strategies
		necessary (e.g. sensitive data is being collected) If collecting information from the dyad (two individuals together) then, the protocol needs to include specific instructions for research staff to give to dyads about responding, e.g. importance of gaining each individual's different perspective and asking them not to confer If the decision is made to collect the data from each individual separately then, before separating them, each person should be assured of confidentiality regarding his or her responses. Depending on the purpose of the study, researchers should reinforce that the information gained will not be shared by study staff with either individual in the dyad without his or her permission. In an effort to keep patient and partner information confidential, the research protocol may require separate data collectors. If only one data collector is available, the dyad should be given the choice of having the researcher work with one participant at a time. This allows each participant the opportunity to address concerns or questions separately. Thus, if there is only one data collector, the additional burden of time on the participants and researcher for data collection must be accounted for in the planning of the study. Different parts of the study intervention may need to be delivered together to the dyad as a unit and separately to each individual. Separating may cause some concern for either individual in the dyad; thus, the research staff need to be trained adequately to address concerns and provide explanations Consider including measures of burden or distress to ensure that interventions to improve patient outcomes do not also have unintended
	<b>Confidentiality</b> As well as the issues highlighted above, researchers collecting data need to be careful that they do not share data about an individual in the dyad with the other individual.	
	<b>Intervention delivery</b> Consider the potential effect of the intervention on not only the patient but also the informal carer e.g. informal carer may need to take on additional responsibilities	

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Table 2 (continued)

	Potential challenges	Possible strategies
		negative effects on the informal carer
	<b>Data collection at different time points from individuals</b> If collecting data from individuals within the dyad at different time points then the individual who participates first may discuss the study with the other individual within the dyad and this may impact on the data collected	You can ask the first participant to try to avoid discussing the study with the other individual. This may be difficult to fully account for and unavoidable. However, this must be acknowledged as a limitation.
<b>Budgeting</b>	<b>Costs to be considered</b> Travel, incentives, additional caring responsibilities.	If individuals travel separately then account for the travel needs of each individual. If the study requires both individuals to be present to take part at the same time then ensure that the time is scheduled to account for the fact that they may be travelling from different places. Each individual should receive an incentive to take part A greater number of research staff may be needed (see above) as well as office space and computers and this will also need to be accounted for. Informal carers may have other caring responsibilities e.g. children

Each of these has its own benefits, drawbacks and may be applicable or more suitable in particular circumstances, Table 3 provides more detail on this.<sup>27</sup> For example, benefits of separate interviews performed simultaneously by different interviewers include the research interviewer is not influenced by the previously interviewed individual, individuals taking part in the research may feel this as an additional safeguard. A potential drawback of this approach is that each research interviewer comes with a slightly different and unique worldview on phenomenon, with unique way of constructing the interview situation. Therefore, it may be preferable then to use this when the two interviewers have similar worldviews on the phenomenon under study.

Quantitative

There are three approaches:

• **Actor-Partner Interdependence Model (APIM)**<sup>28</sup>

This is the most widely used standard dyadic model for quantitative data analysis. It simultaneously estimates the effects of each individual's characteristics on an outcome variable. As such it therefore requires variables, x and y, where x causes or predicts y. It is important to note that because the APIM assesses both actor and partner effects, both members of the dyad must have scores on both x and y.

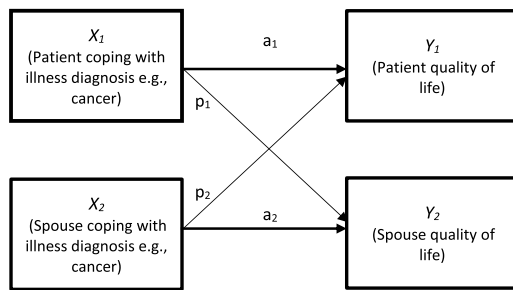
For example, consider the effect of coping with a diagnosis of schizophrenia on informal carers' quality of life. It may be that the patient's coping with their diagnosis of schizophrenia impacts both their own and their informal carer's quality of life. The effect of the patient coping with their diagnosis on their own quality of life is called an actor

Table 3

Comparison Between five different ways of Dyadic Analysis (adapted from Eiskovits & Koren<sup>27</sup>).

Mode	Benefits	Drawbacks	Contextual information that should be considered
Separate interviews	Each individual within the dyad can provide information from their own perspective. Captures the individual within the dyad, without forgoing the dyadic perspective. The dyadic view (a third version) provided by the researcher(s) enriches the perspective on the phenomenon. Trustworthiness is increased (by triangulation.	Partner is virtually present in the research space .Can limit the perception of the phenomenon, as restricted by what partner has said. The dyadic version provided by the researcher (s) is largely interpretive and distant from the descriptive level. There is an ethical problem of revealing information to partner when presenting quotes of each partner alongside each other.	This mode is particularly useful when researching sensitive topics. Most couples have topics that remain private and are not discussed or shared with each other. Interviewer as 'new' makes it easier to reveal and discuss issues e.g., coercive behaviours.
Separate interviews performed simultaneously by different interviewers	All of the advantages stated above. Interviewer will not be influenced by the previously interviewed participant; participants feel additional safeguard.	Each interviewer comes with slightly different and unique worldview.	This mode is preferable when two interviewers have similar worldviews on the phenomenon.
Joint interviews	Allows for a view of a joint picture and shared narrative.  Enables learning from the way partner interact, dominate or are subdued about their role in the relationship.	This mode does not allow for the development individual versions Reduces imbalances (which are desirable in dyadic research) between versions because partners are witness to each other and this decreases the material for analysis.	Useful for analysing interactions between individuals with the dyad.
Both separate and joint interviews with same participants	Carries the benefits of separate and joint interviews.	Impact of what each individual is witness to in the joint interview may impact on versions presented and vice versa.	When topic is not too sensitive. When interaction analysis is a required part of the research study.
Separate interviews with some informants and joint interviews with others	Facilitates comparisons, cross checking, and a form of triangulation.	Triangulation only possible when large sample sizes are used.	When large samples and budgets available.





**Fig. 3.** The Actor-Partner Interdependence Model (APIM). An actor effect, denoted as “a”, occurs when an individual’s score on the predictor variable ( $X_1$ ) predicts that same individual’s score on the outcome variable ( $Y_1$ ). A partner effect, denoted as “p”, occurs when an individual’s score on a predictor variable ( $X_1$ ) predicts her partner’s score on an outcome variable ( $Y_2$ ). Both members of the dyad have an actor effect and a partner effect (adapted from Ref.<sup>28</sup>).

effect, and the effect of the patient’s coping with their diagnosis on informal carer’s quality of life is called a partner effect (see Fig. 3).

- **One-with-many design**<sup>28</sup>

Here, each person is paired with many other individuals, but these others are not paired with any other individuals. For example, a pharmacist might be paired with many patients. The patients may rate their satisfaction with the quality of care provided by this one pharmacist. So, there are multiple patients rating the same pharmacist. In this design patients are not linked to each other in any way, they do not interact with each other.

- **Social Relations Model (SRM)**<sup>28</sup>

There are two types of SRM, the first is a round-robin design in which a group of individuals rate or interact with each other. As such, all individuals are linked to everyone else in the group. The second is known as block design – here a group of individuals are divided into two subgroups, and members of each subgroup rate or interact with members of the other subgroup.

#### (4) Methodological and substantive considerations that require consideration when using dyadic data analysis

There are a range of important issues that researchers should consider when utilising dyadic data designs in health research. If these are properly addressed, then will enhance study findings. Given that this is still a growing area of research this is even more important as it will ensure that the body of literature being formed further informs our understanding. Most of the discussion here will focus on diagnosed/undiagnosed configuration as this is the one most commonly used.

#### Impact of partner effects

<sup>28</sup>

The presence of partner effects important as they traverse individualistic thinking and allow for analysis of interdependent mechanisms that impact on health. A study of 341 parent-adolescent dyads conducted over 5 years in the USA<sup>29</sup> set out to examine how discrimination changes over time, how discrimination is related to health and substance use, and whether discrimination spills over to affect the health of family members. One of the outcomes explored was the association between an individual’s experiences of discrimination and their family member’s mental health. One of the findings of this study was that increases in parents’ reports of discrimination were related to increases in adolescents’ levels of depressive symptoms.

Partner effects are useful as they reveal the role that partners may

have in promoting the others’ health above and beyond the effect that individuals have on promoting their own health.

#### Role as a moderator of actor and partner effects

<sup>28</sup>

Frequently in diagnosed/undiagnosed studies a key question is whether actor or partner effects for diagnosed and undiagnosed partners can reveal differences intra-person versus inter-person. To test for asymmetry of effects by role (i.e., “diagnosed” vs “undiagnosed”), one can undertake tests of interactions between the distinguishing feature (e.g., the role, such as “diagnosed” vs “undiagnosed”) and the predictor variables (e.g., coping). The aim here is to elucidate if any of the interactions by role predicts the outcome. One example of asymmetry in actor effects can be seen in a diagnosed/undiagnosed study<sup>30</sup> in which fear of cancer recurrence in survivors and their informal carers was examined. Individuals (both survivors and caregivers) who reported less positive meaning of the illness had more fear of recurrence, but this relation was stronger for survivors than for caregivers.

Testing interactions with role might help elucidate factors that might have a greater or lesser importance to diagnosed and undiagnosed individuals, and therefore to their wellbeing. Identifying asymmetric effects by testing interactions with role provides useful information that could potentially facilitate focus intervention efforts for both diagnosed and undiagnosed partners.

#### Bidirectional influence

<sup>28</sup>

This is tested using two hypotheses. Bidirectionality is supported only if both partner effects are present (e.g., if  $X_1$  predicts  $Y_2$  and  $X_2$  predicts  $Y_1$ , or in other words the diagnosed partner’s  $X$  predicts the undiagnosed partner’s  $Y$  and vice versa). Bidirectional effects can either be symmetric (the two effects are both either positive or negative predictors of the outcome) or asymmetric (both are present, but with opposite signs). In a longitudinal study of grandparent-grandchild wellbeing,<sup>31</sup> grandchild and grandparent wellbeing were found to be related in a bidirectional manner, but grandchild difficulties have a greater impact on grandparent distress than do grandparent difficulties on grandchild distress.

Identification of particular bidirectional processes which are conserved, and which are diminished by a diagnosis can inform about which relational processes could be maximised, versus those that may need extra attention when dyads are making adjustments (e.g., taking a newly prescribed medication) as the result of a new diagnosis or a different stage within a diagnosis.

#### Asymmetry in Y intercepts

<sup>28</sup>

A question that is of particular relevance to diagnosed-undiagnosed studies is whether or not asymmetry exists in the Y intercepts, or the predicted average score on the outcome variable, when comparing diagnosed partner with an undiagnosed partner. For example, mothers with cancer may report higher, lower, or the same quality of life as their adult informal carer daughters.<sup>32</sup> Frequently, there are mean differences on Y between the diagnosed and undiagnosed members of the dyad. As the outcome variable is often related to physical and/or mental health then this is likely. In addition, it is practical to assume that health scores may differ between the diagnosed and undiagnosed member of the dyad. Further, undiagnosed and diagnosed individuals within a dyad may also be different in outcome measures related to physical health and this may be of particular interest; in such instances physical health would need to be controlled during the data analysis process in order to show that individuals differ on these outcomes after controlling for differences in their health.

*Including an undiagnosed-undiagnosed group*<sup>28</sup>

Researchers might want to consider including an UU group as a control in DD or DU studies. In a DD study this would allow for an exploration of the strength of impact of actor and partner effects. In a DU study this would allow an understanding of how undiagnosed partners in DU couples, compare to individuals in couples completely free of the diagnosis and would provide important information about whether undiagnosed individuals in DU couples have poorer health than those in couples without a diagnosis. Studies conducted with couples in which both smoked reported increased positive emotion and emotional synchrony when smoking together. On the other hand, couples where only one person smoked reported decreased positive emotion and synchrony when their partner lit up.<sup>33,34</sup> These findings illustrate that perhaps discord in relationships (one member smokes and the other does not) may be the most at risk for experiencing more relationship or health oriented concerns.

*Examining mediation*<sup>28</sup>

Mediation in its simplest sense consists of three variables *x* (the causal variable), *m* (the mediator) and *y* (the outcome). So, for example, positive communication between a mother and child where the child has asthma may reduce distress due to greater closeness. For this example, maternal communication is *x*, closeness is *m*, and distress is *y*. The idea being that mediation explains the association between *x* and *y*. A more advanced subject is that of moderated mediation and readers should consult other resources for examples and further explanation.<sup>35–37</sup> Moderation is usually examined by looking at the interaction between the causal variable (*x*) and another variable called the moderator; if mediation is moderated, then mediation is stronger for one individual (e.g., diagnosed) than another (e.g., undiagnosed). This method is useful if there is an interest in understanding causal process that occurs when studying dyads and the impact of disease.

*Including time*<sup>28</sup>

Longitudinal research is becoming a growing field with regards dyadic studies with studies that have multiple time points per variable or per person and these have the potential to address the dynamic aspects of health and social relationships. Similar to studies with individuals these can take the form of daily-diary studies (e.g., exploring the impact of pain from metastatic breast cancer on spousal relationships<sup>38</sup>), intervention studies (e.g., the influence of a “warm touch” intervention in married couples on blood pressure, oxytocin, alpha amylase, and cortisol<sup>39</sup>), or repeated mental or physical health assessments (e.g., measurements of cortisol levels and mood states in romantic partners<sup>40</sup>).

This type of study might be useful if for example, researchers want to explore the impact of baseline characteristics over time or to see if intervention effects were maintained over time. Introducing time in dyadic research allows researchers to assess partners’ health relevant change and flexibility (or inflexibility) over a specified duration.

**Medicines optimisation and illness management research which utilises approaches and methods outlined in this article**

In this section specific examples of medicines optimisation and illness management research which utilise approaches and methods outlined previously will be discussed. Focus is paid to the value that using these approaches have for clinical practice.

- **Qualitative observational study**, 94 *dyadic conversations* about prescribed antihypertensive medications between hypertensive patients and primary care health professionals (nurses and doctors) were recorded and analysed using a **grounded theory approach**<sup>41</sup>

In this study four types of dyadic exchanges were identified: interactive (53% of interactions), divergent-traditional (24% of interactions), convergent-traditional (17% of interactions) and disconnected (6% of interactions). In the interactive and convergent-traditional types, healthcare professionals adopted a patient-centred approach and used communication behaviours to engage patients. The divergent-traditional type was characterised by provider verbal dominance, which had a negative impact on patients’ abilities to interact. In the disconnected type, healthcare professionals used closed-ended questions and terse conversation, which was frequently disregarded by patients who diverted the conversation to psychosocial issues.

Examining the processes that underpin communication in patient—healthcare professional interactions can provide useful information towards improve conversations about medication.

- **Quantitative study**,<sup>42</sup> **questionnaires** undertaken separately in cancer patients and their informal carers (a total of 171 **dyads**) about health care decisions such as where, when and how to receive treatment; decisions on trade-off treatment benefits and side effects; and decisions about hospice care.

**Nonparametric tests and regression analysis** were performed. Significant disagreement occurred about three issues: trade-off between treatment side effects and benefits; reporting adverse effects of medication to clinicians, and hospice care. Informal carers were more concerned about patient’s quality of life and more willing to discuss hospice issues than were patients. Perceived family disagreement is associated with depression in both informal carers and patients.

The study provided empirical evidence for patient-informal carer disagreement about treatment and care decisions and its significant adverse impact on both patients and informal carers.

- **Quantitative study**,<sup>43</sup> **questionnaires** to examine the extent to which patient and doctor symmetry (224 **dyads**) in health locus of control (HLOC) beliefs was associated with objectively derived medication refill adherence in patients with co-morbid diabetes mellitus and hypertension.

In dyads in which there were congruent beliefs about the degree of personal control that individual patients have over health outcomes the patients significantly higher overall and cardiovascular medication regimen adherence ( $p = 0.03$ ) and lower diastolic blood pressure ( $p = 0.02$ ) when compared to dyads in which the patient had a stronger belief in their own personal control than did their doctor. Dyads in which patients held a weaker belief in their own personal control than did their doctor did not differ significantly from symmetrical dyads.

This study demonstrated the importance of attitudinal symmetry on medication adherence and suggest that a brief assessment of patient HLOC may be useful for tailoring the doctors’ approach in clinical interactions or for matching patients to doctors with similar attitudes towards care.

*Key considerations when utilising dyads in medicines optimisation and illness management research*

- Although dyadic research is a significant approach to achieve perspectives on relationships, it is accompanied by a unique set of methodological challenges. These challenges centre around recruitment, retention, and data collection.<sup>23–26</sup> Thoughtful study design and planning ahead can help overcome many of these.
- Methods used to analyse data will depend on whether the study is qualitative or quantitative, in all cases will be driven by how the data is collected. Method chosen will also depend on the research question being asked.



- Partner effects are useful as they reveal the role that partners may have in promoting the others' health above and beyond the effect that individuals have on promoting their own health.
- Identifying asymmetric effects by testing interactions with role provides useful information about factors that could, potentially, facilitate the focus of intervention efforts for both diagnosed and undiagnosed partners.
- Identification of particular bidirectional processes can provide information about which relational processes could be maximised, versus those that may need extra attention when dyads are making adjustments (e.g., taking medication) as the result of a new diagnosis or a different stage within a diagnosis.
- Including undiagnosed-undiagnosed dyads in research aids in understanding of the impact of concordant and discordant relationships on risk for experiencing more relationship- or health-oriented concerns due to diagnosis.
- Examining the effect of mediation is useful if there is an interest in understanding causal process that occurs when studying dyads and the impact of disease.
- Including time (longitudinal research) has the potential to address dynamic aspects of health and social relationships. For example, in research if the effects or implementation of interventions are maintained over time.

## Conclusions

Individuals' physical and mental health can impact on their social relationships and vice versa. Partners, parents, children, friends play a critical role in supporting the health of patients; the utilisation of dyads in research has great potential. An important, unique and valuable perspective is obtained on the complex interactions that underpin the management of illness and medicines optimisation by situating experiences of these withing the dyad. The purpose of this paper was to provide a gentle introduction to this growing field and to clarify some of the main issues with regards the research process. In addition to shed light on some important methodological and substantive considerations that researchers may want to focus on. This article should provide a starting point to inform researchers who wish to pursue this within their own work. The provision of specific examples in relation to medication and illness management should also further excite readers to consider dyadic research. It would appear that this is yet untouched but potentially vast area for researchers interested in medicines optimisation and illness management research alike.

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Not applicable.

## Author contribution

Dolly Sud: Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

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The author declares that they have no conflicts of interests.

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