



## Communication Study

## A novel analytical strategy for patient–physician communication research: The one-with-many design

Nao Hagiwara<sup>a,\*</sup>, Deborah A. Kashy<sup>b</sup>, Louis A. Penner<sup>c</sup><sup>a</sup> Virginia Commonwealth University, Department of Psychology, Richmond, USA<sup>b</sup> Michigan State University, USA<sup>c</sup> Wayne State University, USA

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## ABSTRACT

**Objective:** We aimed to demonstrate how a novel analytic strategy – the one-with-many (OWM) design – can provide unique information about patient–physician communication that cannot be obtained using traditional analytic strategies.

**Methods:** Using an OWM design we conducted a secondary analysis of behavioral (talk time) and self-reported (perceived teamness) data from a study of patient–physician communication, and examined variance decompositions of these variables.

**Results:** Talk time was largely relational, suggesting that there is no behavioral consistency on the part of physicians across patients or behavioral similarity among patients who see the same physician. In contrast, there was significant actor variance in perceived teamness, suggesting that some physicians consistently reported higher teamness with their patients than others. However, those physicians' positive perceptions of the communication are not necessarily reciprocated by their patients.

**Conclusions:** OWM design provides researchers with the opportunity to take full advantage of rich non-independent data and explore interesting communication patterns (e.g., behavioral continuity, similarity, reciprocity unique to specific dyads) that have been omitted in prior literature.

**Practical implications:** OWM can be used to determine the relative differences in how patients and physicians influence communication patterns and identify which aspects of physician–patient communication are relational and which are not.

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Patient–physician communication plays a critical role in predicting patients' health-related attitudes and behaviors, and thus ultimately their health outcomes. For instance, communication patterns characterized as patient-centered are associated with greater patient satisfaction, higher rates of adherence, and better medical outcomes [1–6]. Additionally, because many dimensions of patient–physician communication are malleable, findings from patient–physician communication research are important in physician education and training [7,8]. Consequently, numerous studies have examined (and continue to examine) how physicians and patients influence the dynamics of their communication.

In most existing patient–physician communication studies, each physician sees multiple patients. This results in complex non-independent data because patient's outcomes may be related to

the outcomes of other patients who see the same physician. However, the traditional analytic strategies used in these studies fail to take full advantage of such rich non-independent data. More specifically, traditional analytic strategies usually treat each patient–physician pair as the unit of analysis, ignoring the fact that the physician in one interaction may be the same physician in several other interactions. Some researchers address such bias by treating physicians as a nuisance parameter in multilevel models (MLM) or generalized estimating equations (GEE) [7–15]. Although this approach corrects for statistical bias, it still does not take full advantage of the richness of non-independent data provided by patient–physician communication. We believe that this complex non-independence in data itself represents important aspects of patient–physician communication. To provide one example, if all patients who see Dr. Smith report higher levels of satisfaction than patients who see Drs. Johnson, Williams, or Brown, this suggests that there is *consensus* among Dr. Smith's patients and that Dr. Smith has some unique characteristics that influence his/her patients' experience. Thus, analytic approaches that explicitly

\* Corresponding author at: 808 West Franklin Street, PO Box 842018, Richmond, VA 23284-2018, USA. Tel.: +1 804 828 6822; fax: +1 804 828 2237.

E-mail address: [nhagiwara@vcu.edu](mailto:nhagiwara@vcu.edu) (N. Hagiwara).

model non-independence can provide researchers the opportunity to explore relative differences in how patients vs. physicians influence communication patterns during medical interactions. The goal of this article is to introduce a novel approach, the one-with-many (OWM) design, [16,17] and demonstrate how this design can be used to better understand physician–patient communication. This analytical approach can address important questions (e.g., “How do patients and physicians mutually influence their communication patterns?” and “Which dimension of patient–physician communication is more relational in nature than other dimensions?”) that researchers have been investigating. In addition, the OWM design allows researchers to explore interesting communication patterns (e.g., behavioral continuity, similarity, reciprocity) that have not been systematically examined in prior literature.

## 1. The one-with-many (OWM) design in patient–physician communication

In the context of medical interactions, the OWM design can take into account the non-independence in communication-related data, both behaviors (e.g., talking, expressing emotion) and perceptions/self-reports (e.g., perceived communality, patient involvement), among multiple patients who see the same physician. In this design, the “one” is the physician, and his or her patients are the “many.” Data obtained in the OWM design can be provided by the one, the many, or both. When the data come only from physicians, it is called a *one-perceiver-many-targets* design because one physician provides data on his/her communication with multiple patients. In contrast, when the data come only from patients, it is called a *many-perceivers-one-target* design because every patient who sees the same physician provides data on communication with him/her [18]. Finally, when the data come from both physicians and patients, it is called a *reciprocal* design [18]. The OWM design provides two types of analysis simultaneously: variance decomposition and association.

### 1.1. Variance decomposition

Focus on the variance decomposition is what differentiates OWM designs from the standard MLM. Specifically, the model partitions the variance in communication data assessed for the physician, the patient, or both, into distinct components. When the physicians provide data in the one-perceiver-many-target design, the OWM design decomposes variation in physician’s behaviors/perceptions into two components: an *actor* effect and a *relationship* effect. The actor effect estimates the degree to which a physician behaves/responds in a similar fashion toward all of his/her patients. Thus, evidence of significant actor effects for physicians suggests that there may be behavioral continuity across patients for the physicians. Additionally, the physician’s unique responses to particular patients (along with error variance) are modeled in the OWM design as the relationship effect.

When the patients provide data in the many-perceivers-one-target design, the OWM design also decomposes variation in patient’s behaviors/perceptions into two components: a *target* effect and a *relationship* effect. The target effect measures the degree to which all of physician’s patients tend to behave/respond in a similar manner when with him/her. Thus, presence of the target effect implies that there is something in the physician’s behavior that elicits similar reactions from patients. Additionally, the relationship effect assesses the patient’s unique behaviors/perceptions to the physician (plus error).

Finally, when both physicians and patients provide data in the reciprocal design, the OWM design estimates all the actor, target, and relationship effects discussed above. Additionally, this design enables researchers to investigate two types of reciprocity in the

responses of patients and physicians [9]. *Generalized reciprocity* measures the degree to which a physician who behaves/responds in a particular way across his/her patients has patients who typically behave/respond in a similar fashion with him/her. *Dyadic reciprocity* measures whether a physician’s unique behavior toward an individual patient is reciprocated by the patient.

### 1.2. Associations between covariates and actor, target, and relationship effects

In addition to the variance decomposition, the OWM design can also estimate fixed effects, which tend to be the focus of the standard MLM and GEE approaches. More specifically, the OWM design can estimate relations between physician-level and patient-level covariates and the actor, target, and relationship effects. Important questions in the context of patient–physician communication that can be addressed at the physician level are associations between physician characteristics (e.g., years in practice, gender, racial bias) and significant actor and/or target effects. For instance, an association between a physician characteristic, such as racial bias, and the actor effect for talk time might show that physicians who have higher racial bias generally tend to talk more with all of their patients. An association between racial bias and the target effect for talk time might show that physicians who have higher racial bias have patients who talk more on average.

Of particular interest to patient–physician communication researchers may be the associations between patient communication outcomes (e.g., satisfaction, adherence, health status) and significant actor, target, and/or relationship effects. For example, an association between the actor effect for talk time and patient health status might show that physicians who talk a great deal to all of their patients tend to, on average, have patients with better health outcomes. An association between the target effect for talk time and patient health status might show that physicians whose patients generally talk more tend to have patients with better health outcomes. Finally, an association between the relationship effect for talk time and patient health status might show that patients who elicit especially high levels of talk from their physician tend to have better outcomes.

## 2. The present study

In the present study, which was a secondary analysis of self-report data and video-recordings from a larger study of clinical interactions between low-income Black patients and their non-Black primary care physicians, [19,20] we provide examples of how the OWM design can be utilized to assess both behavioral (i.e., talk time) and self-reported (i.e., perceived teamness) measures to examine the quality of patient–physician communication. More specifically, we will first demonstrate what variance decompositions of talk time and perceived teamness can tell researchers about the dynamics of patient–physician communication. **Tables 1 and 2** present the specific questions for talk time and perceived teamness, respectively, that can be addressed by the variance decomposition. Next, we will demonstrate how the OWM design can estimate the association between physician characteristics (i.e., implicit racial bias) and talk time/perceived teamness and between patient communication outcomes (i.e., adherence) and talk time/perceived teamness. **Table 3** summarizes questions that are being addressed by estimating the association between physician bias, patient adherence, and significant actor, target, and relationship effects of talk time/perceived teamness.

We will focus on talk time as an example of behavioral data because it is an important component of patient-centered communication [21] – talk time has been shown to be associated with patient trust, patients’ and physicians’ racial bias, and patient

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