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Interpersonal Attraction in Dyads and Groups: Effects of the Hearts of the Beholder and the Beheld

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Abstract

Dyadic interpersonal attraction (IA) was studied within groups of very highly acquainted family members, friends and co-workers. IA was determined by the perceiver (i.e., the heart of the beholder), the target (i.e., the heart of the beheld), and in specific dyads, by the unique combination of the two. The consistency of one's attraction to others and others' attraction to the person across groups were addressed using the *key person design*. Attraction to a person in one group was independent of attraction to that person in another, although people predicted that members of different groups were similarly attracted to them. A new model (ARRMA) was specified to simultaneously study assumed reciprocity, actual reciprocity, and metaperception accuracy of attraction (i.e., accurate predictions of others' attraction to oneself). Assumed reciprocity of IA was substantial at the individual and dyadic levels. Reciprocity of attraction at the individual level, a heretofore unconfirmed "plausible hypothesis" (Newcomb, 1979), was supported; dyadic reciprocity was weak. Meta-accuracy of IA was observed among individuals but was weak in dyads. Perceived interpersonal similarity predicted IA among individuals and in specific dyads. Considering dyadic attraction within and between groups, and the use of componential analysis permitted the specification of new IA phenomena and resolved a long standing theoretical problem regarding the reciprocity of attraction.

Seminal mid-twentieth century research on "social preferences" focused on interpersonal attraction in dyads; Tagiuri (1958) proposed "The two-person group is without doubt the most crucial social situation, perhaps even the most crucial of *all* human situations" (p. 329). Despite this importance, the complexity of dyadic analysis hindered its implementation (Cronbach, 1955; 1958), and modern research on interpersonal attraction (IA) is primarily monadic (see Kenny, 1994; Krause, Back, Egloff & Schmukle, 2014 for exceptions). Conceptualizing IA as a dyadic phenomenon and implementing variance component analysis permitted the specification of new phenomena, and resolved lingering theoretical questions (Newcomb, 1979). An important novel feature of this research is that IA was studied in the context of fundamental human relationships where people lead their lives.

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Five new lines of inquiry characterize this research. First, classic and new attraction phenomena are studied at the individual, dyadic and group levels. At the individual level, the concern is with a person's general level of attraction to multiple others (the perceiver), and the attraction of multiple others to the individual (the target). At the dyadic level, the concern is with one person's unique attraction to a specific other. Bob may be uniquely attracted to Jerry as a collaborator on a work project, while being uniquely un-attracted to Phil as a vacation companion. Failure to separate individual and dyadic IA conflates theoretically distinct attraction phenomena and biases estimation of them (Kenny, West, Malloy & Albright, 2006). Second, IA was studied in social groups (families, friends and co-workers) where people lead virtually all of their lives. Group members were very highly acquainted (some for decades) and this contrasts with most IA research where acquaintance is low. Third, the research addressed the consistency of IA across groups; are people attracted to members of different groups at similar levels, or does attraction to others vary from group to group? A related question is: are members of different groups attracted to a common member of each at similar levels, or is attraction to a person context specific? Although these questions have been considered for trait perceptions (e.g., Malloy, Albright, Kenny, Agatstein, & Winquist, 1997; Malloy, Albright, Diaz-Loving, Dong, Q., & Lee, 2004), there has been no attention to IA of which I am aware. Fourth, a new theoretical model (ARRMA) was specified to study three related attraction phenomena: assumed reciprocity, reciprocity and the accuracy of metaperception (i.e., accurate awareness of others' attraction to one's self). Fifth, while it is known that perceived similarity is correlated with IA (Byrne, 1971); this relationship was considered among individuals and in dyads. The similarity – attraction relationship was split (cf. Kenny & Nasby, 1980) and considered at each level separately.

Determinants of Interpersonal Attraction

Much is known about IA, but there is much to know. Classic research showed that familiarity (Festinger, Schachter & Back, 1950) increases attraction among strangers and has implications for relationship formation (Krause et al., 2014; Reis et al., 2011). In contrast, participants in the present research were highly acquainted, some for decades. Little is known about the social psychology of attraction among the well acquainted; this extension is warranted because IA is thought to vary for different types and stages of dyadic relationships (Finkel, Norton, Reis et al., 2015).

Often, attraction research is not conducted in dyads or groups, yet these contexts permit specification of new theoretical questions. Are there differences among highly acquainted group members in their attraction to the other members? Are group members more attracted to one member than another? Are specific members of a dyad uniquely attracted or un-attracted to each other? Although theoretically important, these basic questions have received limited attention (Kenny, 1994; Krause, Back, Egloff & Schmukle, 2014)

A classic finding is that perceived similarity breeds attraction (Byrne, 1971). To my knowledge, no research has simultaneously considered the relationship between perceived similarity and attraction at the individual and dyadic levels. Consequently, it is unknown if

the “similarity-attraction principle” (Fiske, 2010, p. 293) operates only at the individual level, or also at the dyadic level. The present research addresses these questions.

IA is predicted to vary in different relationship contexts (Finkel, et al., 2015). Context specific IA has received the most attention (e.g., Byrne, 1971; Fujino, 1997; Lubitschek & Hallinan, 1998), however, little is known about IA across contexts (Finkel & Eastwick, 2015). If a person elicits high or low attraction from others in one context (e.g. at work), will that person elicit a similar level of attraction in another (e.g. among friends)? An answer to this question does not exist, but is informed by research on interpersonal trait perception using the *key person design* (Malloy, Albright, Kenny, Agatstein, & Winquist, 1997; Malloy, Albright, Diaz-Loving, Dong, Q., & Lee, 2004). In that design, the key person is the only common member of different groups; each composed of three additional people who rate the personality traits of other members, including the key person. Using social relations modeling, a measure of agreement in trait judgments of the key person within each group was correlated across them. In the United States (Malloy et al., 1997) and China (Malloy et al., 2004), agreement in trait judgments within groups was statistically reliable for each of the Big Five personality factors, however agreement across groups was substantially weaker. This showed that consensual trait judgments were context specific; individuals’ traits were not judged similarly across different groups. Groups serve different functions; families provide nurturance, among friends emotional relationships are central, whereas at work, task performance is central. If different group functions afford different interpersonal responses (McArthur & Baron, 1983), members of different groups have different information about, and experience with, a person who is a common member of each. Consequently, trait judgments across groups are inconsistent. Similar logic applies to IA (cf. Finkel et al., 2015).

IA research has historically relied on a single measure: liking. In the present research, measurements of IA were guided by the comprehensive psychometric work of McCrosky, McCrosky and Richmond (2006) that specifies three distinct attraction constructs (task, social, and physical) as well as a perceived similarity construct. This psychometric advancement is important for considering different facets of IA that are precluded when using a single measure of liking.

Social Relations Analysis of the Hearts of the Beholder and the Beheld

The dyadic structure of IA appears deceptively simple. Imagine two people i and j . If i ’s attraction to j and j ’s attraction to i are measured, these scores seemingly index their interpersonal attraction. However, this is erroneous. Theoretically distinct components of i ’s attraction to j and j ’s attraction to i can be specified (Malloy & Albright, 1990). In dyads, attraction scores are affected simultaneously by the hearts of the beholder and the beheld at the individual and dyadic levels. The Social Relations Model (SRM; Malloy & Kenny, 1986; Kenny, 1994) conceptualizes and estimates interpersonal responses at these levels.

The SRM specifies four components of IA that are of theoretical interest and a random error component. Of interest are elevation (μ), the perceiver effect (α), the target effect (β) and the uniqueness effect (γ). *Elevation* is the average level of attraction amongst a group of people. The *perceiver effect* quantifies differences in attraction to the same set of partners. For

example, in a group of coworkers one may be attracted to the other members, whereas another is not. The perceiver effect quantifies the impact of the heart of the beholder. The *target effect* quantifies the level of attraction to different people. For example, among friends one member may be a desirable social interaction partner, whereas another may be undesirable. The target effect quantifies the impact of the heart of the beheld. Perceiver and target effects index attraction of one to many and many to one, respectively. Statistically, individual is the unit of analysis. The *uniqueness* effect is dyadic and quantifies one person's unique attraction to a specific other. Statistically, the dyad is the unit of analysis.

This conceptualization of i 's attraction to j (A_{ij}) within group k , can be represented by:

$$A_{ijk} = \mu_k + \alpha_i + \beta_j + \gamma_{ij} + \varepsilon_{ijk} \quad (1)$$

Equation 1 states that in group k , i 's attraction to j is equal to the average level of IA in group k (μ_k), plus the consistency of i 's IA to members of k (α_i), plus the attraction elicited consistency by person j in group k (β_j), plus i 's unique attraction to j (γ_{ij}), after controlling for α_i and β_j . There is also random error in i 's response to j (ε_{ijk}).¹ Person j 's IA to i can be represented by the same theoretical equation, although the subscripts change appropriately. That is:

$$A_{jik} = \mu_k + \alpha_j + \beta_i + \gamma_{ji} + \varepsilon_{jik} \quad (2)$$

Variance Components in Interpersonal Attraction within Groups

Variances of the components of IA specified in equations 1 and 2 are computed (Warner, Kenny & Stoto, 1979) within each group context. If a variance component is zero, it does not determine IA. Of interest are the perceiver, target and uniqueness variance components, and Table 1 provides a guide to their interpretation. *Perceiver variance* (σ_α^2) quantifies individual differences in IA among group members. When members differ in their attraction to the same set of targets, perceiver variance increases. *Target variance* (σ_β^2) quantifies individual differences among targets in the attraction to them by group members. When one target elicits a high level of attraction and another elicits a low level of attraction, there are individual differences among targets in group members' attraction to them. As these individual differences among targets increase, target variance increases. *Uniqueness variance* (σ_γ^2) quantifies IA that is dyad specific; members of a dyad may be uniquely attracted or un-attracted to one another. Because IA constructs are partitioned from error, total construct variance (σ_A^2) is the sum of perceiver, target, and uniqueness variance components. That is:

$$\sigma_A^2 = \sigma_\alpha^2 + \sigma_\beta^2 + \sigma_\gamma^2 \quad (3)$$

¹Because there were multiple indicators of three attraction constructs and the similarity construct, perceiver, target and uniqueness effects of the social relations model are partitioned from error. They are latent constructs measured without error.

Variances components are standardized as the proportion of total variance and range from 0 to 1.00.

Effect Estimates and Variance Components in Metaperception of IA

A metaperception of IA is one's perception of another's attraction to oneself, and has received scant attention. Metaperceptions can be decomposed using equations 1 and 2, and then perceiver, target and uniqueness variance components can be computed. However, the psychological meaning of the variance components in metaperceptions differs from those for IA (see Table 1).

Perceiver variance in metaperceptions (σ_a^2) quantifies individual differences in beliefs about group members' attraction to one's self. For example, one member may perceive that others are attracted to her, whereas another may perceive the opposite. Target variance (σ_β^2) in metaperceptions quantifies group members' agreement that a person is generally attracted or un-attracted to the different members. Uniqueness variance (σ_γ^2) in metaperceptions quantifies individuals' beliefs that specific others are uniquely attracted or un-attracted to them. Person A may believe that person B is uniquely attracted to her, whereas person C may believe that person D is uniquely un-attracted to him.

Interpersonal Attraction across Groups

Recall that a basic aim is to determine if people are similarly attracted to members of different groups. A related aim is to determine if members of different groups are similarly attracted to a common member of each group. Family members, friends and co-workers reported their attraction to one another producing a round robin in each group (Warner et al., 1979) that was embedded within the key person design (Figure 1). This design permitted assessment of IA within and between groups; its structure follows.

Initially, key persons (the only common member of different groups) nominated three family members, three friends and three coworkers with the constraint that members within groups were acquainted, and across groups were unacquainted. Nominees in different groups did not know one another, nor had they observed the key person behave in the same environment. These constraints produced *non-overlapping* groups (Malloy et al., 1997). The key person was the only common member of each family, friend and co-worker round robin.

Consistency of attraction to others across groups

If one's behavior determines others' attraction to the person in one context (Kenny & Malloy, 1988), and if behavior is stable across contexts, attraction to the person should be stable across them. To study the consistency of attraction to a person across groups one should use only the appropriate terms from equations 1 and 2 (also see the Appendix). In those equations the subscript k indicated a single context. With the key person design, the constant (μ), perceiver (α), target (β) and uniqueness (γ) effects are estimated in at least two contexts. In contexts a and b , the key person is the only common member and can be designated as t . Person i 's response to key person t in context a on dimension X can be expressed by:

$$X_{ita} = \mu_a + \alpha_{ia} + \beta_{ta} + \gamma_{ita} + \varepsilon_{ita} \quad (4)$$

In context b , perceiver j 's response to t can be expressed by:

$$X_{jtb} = \mu_b + \alpha_{jb} + \beta_{tb} + \gamma_{jtb} + \varepsilon_{jtb} \quad (5)$$

Equations 4 and 5 show the components of IA to the key person within two groups. Two basic questions may be addressed: Are members of non-overlapping groups similarly attracted to the key person? Is the key person similarly attracted to the members of non-overlapping groups?

Consistency of attraction to the key person across groups

In this case, the consistency of one's target effect in IA across groups is of interest. In equations 4 and 5, the key person's target effects estimated in groups a and b are two independent replications of attraction to t , and are coefficients of determination. Consequently, the consistency of t 's target effects across the two groups is estimated by the correlation of β_{ta} and β_{tb} . If key persons t elicits similar levels of attraction from members of a and b , this positive correlation will depart reliably from zero; if not, attraction to t is inconsistent across groups and context specific. The appendix specifies the logic for why undecomposed IA scores (X_{ita} and X_{jtb}) should not be used to estimate consistency across groups.

Consistency of the key person's attraction to others across groups

Perceiver variance within a single group quantifies individual differences in attraction to the members. If a key person t is generally attracted or un-attracted to others within one group, is t generally attracted or un-attracted to others in another group? The consistency of behavior across contexts is a basic problem in psychology, and classic work (Mischel, 1968) suggests moderate consistency. However, as seen in trait perception research ((Malloy et al. 1994; Malloy et al., 2004) in China, Mexico and the U.S., people believed that members of different groups judged their traits similarly. I believe key persons' attraction to others across groups will be reliably consistent across them. This should occur because people are motivated to perceive consistency in their social orientation to others (Higgins, King & Mavin, 1982). A belief that one's attraction to others is consistent across groups also meets a basic cognitive need for stable, coherent cognitions about the self (Heider, 1958). The consistency of attraction to others across groups is estimated by the correlation of the key persons' perceiver effects in IA across them.

ARRMA: Assumed Reciprocity, Reciprocity and Metaperception Accuracy

Another basic aim is to introduce a new theoretical model of three related dyadic IA phenomena intertwined conceptually and statistically. These phenomena are assumed reciprocity, actual reciprocity and metaperception accuracy, which operate simultaneously at

two levels of analysis: individual and dyadic. Estimates of them can be produced at each of these levels.

The ARMMA model at the individual level is represented by a path diagram in Figure 2, and the formal specification of ARRMA is in the appendix. The logic of ARRMA follows. Assumed reciprocity of attraction occurs when people believe that others' attraction to them is similar to their attraction to those others. Tagiuri (1958, p. 321) called this *congruency*: "the tendency ... to perceive a person's feeling for us as congruent with our feelings for him" and concluded that it "exceeds what would be expected on the basis of actual levels of reciprocation." Kenny (1994) reached the identical conclusion.

Reciprocity at the individual level occurs when one's attraction to others is reciprocated by them. Although individual reciprocity of attraction has been considered a "plausible hypothesis" (Newcomb, 1979) for decades, empirical support has remained elusive (Kenny & LaVoie, 1982). Newcomb (1979) offered explanations for his failure to confirm this hypothesis, although he did not consider the componential structure of IA. Kenny and LaVoie (1982) used componential analysis but also failed to garner evidence for reciprocity of attraction at the individual level; they did, however, find evidence for dyadic reciprocity.

People assume that their attraction to others, or to a specific other, is reciprocated by them. When assumed reciprocity is extremely high (parameter b in Figure 2), reciprocity (parameter a) and metaperception accuracy (parameter c) can be affected. Tagiuri (1958) concluded:

"Undoubtedly, the most powerful relationship encountered ... is that of congruency – the tendency, *correctly based on experience* (italic added), to perceive a person's feeling for us as congruent with our feeling for him" (p. 321).

Tagiuri (1958) believed that assumed reciprocity was robust and rooted in others' actual attraction to an individual. As a result, one's predictions of others' attraction to the self (i.e., metaperceptions) are a function of others' actual attraction.

Alternatively, metaperceptions may be due to one's attraction to others, rather than others' attraction to the self. When forming a metaperception, one's attraction to another is readily available (Tversky & Kahneman, 1973) and bound with the motivation to perceive balanced interpersonal relationships (Heider, 1958). Theoretically, one's general level of attraction to others (i.e., the perceiver effect) determines one's prediction of others' attraction to the self (i.e., the perceiver effect in metaperception) much more strongly than does the target effect in attraction (i.e., others' consensual attraction to the person). This availability – balance theory is consistent with abundant trait perception data showing that perceiver effects and metaperceptions of trait judgments correlate very highly (Kenny & DePaulo, 1993)

At the individual level, ARRMA includes three variables produced in an initial social relations analysis. They are the perceiver effect in IA, the perceiver effect in metaperceptions of IA, and the target effect in IA. The three paths linking these variables in Figure 2 estimate different phenomena; parameter a estimates reciprocity, b estimates assumed reciprocity and c estimates metaperception accuracy. Tagiuri (1958) predicted that parameter c should be stronger than parameter b because others' attraction is the cause of the perceiver effect in

metaperceptions of attraction. I, on the other hand, predict that parameter b has a stronger effect on metaperception than parameter c. This alternative to Tagiuri presumes that one's perceiver effect in IA is the cause of one's perceiver effect in metaperceptions.

Path modeling estimated parameters a, b and c among individuals. If assumed reciprocity of attraction is substantial, yet individuals, in fact, elicit different levels of attraction from others, metaperception accuracy should be relatively weaker. Moreover, at the dyadic level the assumption that specific others reciprocate one's unique attraction to them should also weaken dyadic metaperception accuracy when specific others' attraction to a person varies. The attenuation of metaperception accuracy, at both the individual and dyadic levels, can be explained parsimoniously by robust assumed reciprocity (Tagiuri, 1958) that is offspring of the availability of one's attraction to others (Tversky & Kahneman, 1973) and the strain toward cognitive balance (Heider, 1958; Zajonc, 1960). This attenuation is strongest when the other's level of attraction to the self is different from one's attraction to the other.

The Present Research Hypotheses

Variance Components in Interpersonal Attraction within Groups

Differences among perceivers in attraction to others (Hypothesis 1), as well as differences among targets in attraction to them (Hypothesis 2) were expected. Specifically, perceiver and target variance components were expected to differ reliably from zero. Moreover, people were expected to be uniquely attracted to specific others (Hypothesis 3) and uniqueness variance should differ reliably from zero. Kenny (1994) hypothesized that perceiver, target and uniqueness should account for 20%, 10% and 40% of the variance in IA, respectively. This means that IA is primarily dyad specific, then a function of the heart of the beholder and more weakly due the heart of the beheld.

Variance Components in Metaperceptions within Groups

Differences among perceivers in their predictions of others' attraction to them were expected (Hypothesis 4); some should believe others are attracted to them, and some should believe others are less attracted to them. I also expected that perceivers would predict that specific others are uniquely attracted to them (Hypothesis 5). Statistically, perceiver and uniqueness variance components in metaperceptions were expected to differ reliably from zero. There was no expectation that group members would consensually agree that some people are generally attracted to others while others are not; consequently, target variance in metaperceptions was expected to be near zero. This is very common for metaperceptions. While certainly there are Pollyanna's that are attracted to everyone and Curmudgeons who are attracted to no one, they are expected to be the exception rather than the rule. Thus, consensus indexed by target variance is precluded.

Consistency of Attraction and Metaperceptions of Attraction across Groups

In research on trait perception in non-overlapping groups in the U.S. and China a general pattern emerged: within groups trait judgments were consensual, whereas across groups there was much less agreement (Malloy et al. 1997; Malloy et al., 2004). Because IA is predicted to be strongly dyadic, coupled with evidence for context specific interpersonal

processes, the consistency of attraction to key persons was expected to be weak but statistically reliable across groups (Hypothesis 6).

As seen in the U.S., China and Mexico, people believe that members of different groups judge their traits similarly. The median consistency of metaperceptions on Big Five personality factors across non-overlapping groups was approximately $r = .65$ (Malloy et al., 1997; Malloy et al., 2004). Likewise, individuals should predict that members of different groups are similarly attracted to them (Hypothesis 7).

ARRMA

Individual and dyadic assumed reciprocity of attraction—Assumed reciprocity of IA can occur at the individual and dyadic levels. Based on a review of four studies of interpersonal liking, Kenny (1994) concluded that assumed reciprocity at the individual level was substantial. People are motivated to belong to groups (Fiske, 2010), their attraction to others is readily available (Tversky & Kahneman, 1973), and they strive to maintain consonant social cognitions (Heider, 1958). Merely because of the need for inclusion and the desire to maintain a balanced set of interpersonal cognitions, there should be evidence for individual and dyadic assumed reciprocity (Hypotheses 8 and 9, respectively).

Individual and dyadic reciprocity of attraction—The reciprocity of attraction is an enigmatic phenomenon. It seems reasonable that if one is attracted to others they should reciprocate that attraction, but as Newcomb discussed (1979), reciprocity has been elusive empirically. In a review of 5 studies that used componential analysis of liking, the median individual reciprocity correlation was $r = .12$, whereas the median dyadic reciprocity correlation was $r = .58$ (Kenny, 1994). However, these findings are based on studies that used a single measure of attraction (i.e., liking); in this research, psychometric advances that yield more nuanced measures of IA were instituted. Another difference is the level of acquaintance in this research and in studies Kenny (1994) reviewed. Participants in this study were very highly acquainted in established relationships. Kenny (1994) concluded that reciprocity of attraction should not be evident at the individual level, but should emerge at the dyadic level. However, I propose a different prediction: individual reciprocity should be reliable statistically (Hypothesis 10) but relatively weaker than assumed reciprocity and this is why. If group members are, in fact, attracted to each other, even though assumed reciprocity is strong, there should also be evidence for reciprocity of attraction. Similarly, if dyad members are uniquely attracted to each other, and assume reciprocity, dyadic reciprocity of IA should also be statistically reliable (Hypothesis 11) but relatively weaker than dyadic assumed reciprocity.

Individual and Dyadic Metaperception Accuracy of Attraction

As a consequence of strong assumed reciprocity, metaperception accuracy of IA at the individual (Hypothesis 12) and dyadic (Hypothesis 13) levels should be relatively weak but reliable statistically. IA among family members, friends and co-workers is likely to vary from dyad to dyad. When others' attraction to the self varies, one cannot accurately know the attraction of people generally, or a specific others' attraction to oneself, while operating under the illusion of strong assumed reciprocity. Although one may be attracted to others

generally, or a specific other, it does not necessarily follow that they reciprocate that same level of attraction. As a result, strong assumed similarity of attraction likely attenuates the accuracy of individual and dyadic metaperceptions.

Splitting the Perceived Similarity – Attraction Correlation

The finding that perceived similarity promotes attraction is a basic principle of social psychology (Fiske, 2010); however, this relationship has only been considered at the level of individuals with no attention to the dyadic level. As demonstrated by Kenny and Nasby (1980), interpersonal reciprocity occurs at the individual and dyadic levels simultaneously; this should also be true for the similarity- attraction relationship. At the level of individuals, one should be more attracted to others perceived as similar and less attracted to others perceived as dissimilar (Hypothesis 14). At the dyadic level, the more one perceives a specific other as uniquely similar or dissimilar to oneself, the more or less attracted one should be to the person (Hypothesis 15). The similarity - attraction relationship should be considered at both levels.

Method

Participants

Students in an advanced methodology course recruited twenty-eight key persons from their social networks in the United States. Key persons nominated 3 friends, 3 family members and 3 coworkers with the constraint that people within groups were acquainted, but across groups never interacted with one another, nor observed the key person in the same environment. Complete data from all 10 members was available for 25 groups. Three groups were excluded; in one the key person declined to continue and two with minimal data collected from nominees. This produced 25 key persons (6 males and 19 females, mean age 29, age range 20 to 63 with SD 12.8) and 225 informants. Neither key persons nor informants received any compensation. In families, there were 25 males and 75 females with a mean age of 41.32 years (SD = 16.9) with an average acquaintance of 10.77 years (range 1 to 64 years). Among friends, there were 37 males and 63 females with a mean age of 29.65 years (SD = 12.98) with an average acquaintance of 3.65 years (range from .25 to 53 years). Among coworkers, there were 26 males and 74 females with a mean age of 33.46 years (SD = 13.58) with an average acquaintance of 1.36 years (range from .25 to 30 years). Participants were highly acquainted within groups.

Procedure and Measures

IRB review occurred, informed consent was given by all participants and data were collected between August and December, 2012. Key persons came to a laboratory and rated their attraction and perceived similarity to the 9 informants they nominated. The order of ratings and informants was random for each key person. Researchers contacted informants by telephone and guided them through an interview in which they rated their attraction to each member of their group including the key person. Within groups, the order of targets and ratings were random for every informant. In addition to the attraction and perceived similarity ratings, key persons and informants predicted how each person rated their

attraction and similarity to them. These metaperceptions were collected using the same random structure as the ratings.

The psychometric work of McCroskey, McCroskey and Richmond, (2006) revealed three distinct attraction constructs: task/work attraction, social attraction, and physical attraction. Task/work attraction was measured by the following items: I have confidence in her/his ability to get the job done, I would enjoy working on a task with her/him and this person would be an asset in any work situation. Social attraction was measured by the following items: I think he/she is a friend of mine, I would enjoy a friendly chat with him/her, it would be easy to establish a personal friendship with this person, he/she fits in well with my circle of friends, and he/she would be pleasant to be with. Physical attraction was measured by the items: I think she/he is pretty/handsome, this person looks appealing, and she/he has an attractive face. Perceived interpersonal similarity was measured by the items: this person and I are from a similar social class, this person thinks like me, this person treats people like I do, this person is similar to me, and this person behaves like me. Responses were made on a 7 point scale (1 completely disagree-7 completely agree).

Design and Statistical Analyses

The key person design (Figure 1) with non-overlapping groups was used, and nested within each were round robins that permitted social relations analyses within the family, friend and co-worker groups. Estimates of perceiver, target and uniqueness effects in attraction constructs, the perceived similarity construct and metaperceptions for these constructs were computed using WinSOREMO software (Kenny & Xuan, 2004). Estimation of the consistency of IA across groups was accomplished using standard software. Estimation of the parameters of the ARRMA model was accomplished using AMOS 7.

Results

Variance Components in Interpersonal Attraction Constructs within Groups

Results supported Hypotheses 1 and 3. The median standardized perceiver variance component across attraction constructs and groups was .18, and should be interpreted as a proportion of total variance.² All 9 (3 constructs in 3 groups) perceiver variances were reliably different from zero and showed that some people were attracted to other members, whereas others were less attracted to them. A median standardized uniqueness variance component across attraction constructs and groups was .27; all 9 were reliably different from zero. In some dyads IA was uniquely high, whereas in others IA was uniquely lower.

Target variances index consensual attraction to individuals within a group. Median standardized target variance across IA constructs and groups was .12; approximately 78% were reliably different from zero. Target variances in task and physical attraction were reliably different from zero in all groups, and target variance in social attraction was reliably different from zero among friends. These results supported Hypothesis 2.

²In this case, 18% of the total variance in IA can be explained by differences among perceivers in their attraction to the same group members.

The median perceiver, target and uniqueness variance components across constructs and groups were .18, .12 and .27, respectively. These data (Table 2) conform to Kenny's (1994) hypothesized values of .20, .10 and .40, respectively. Krause and colleagues (2014) reported similar results for interpersonal liking. These variances confirm that interpersonal attraction is most strongly dyadic, although perceiver and target effects are also important determinants.

Variance Components in Metaperceptions of Interpersonal Attraction

Results supported Hypotheses 4 and 5 (see Table 3). The median standardized perceiver variance component in metaperceptions across constructs and groups was .36; all 9 were reliably different from zero. Median uniqueness variance in metaperceptions across constructs and groups was .23; all 9 were reliably different from zero. The median standardized target variance component in metaperceptions across constructs and groups was .04; none were reliably different from zero. Metaperceptions of IA were determined by individual differences among group members in their beliefs regarding other members' attraction to them, and by the belief that specific others were uniquely attracted to them. There was no evidence that people believed that particular members were generally attracted to other members at high or low levels.

Consistency of Interpersonal Attraction and Metaperceptions across Groups

Hypothesis 6 predicted that the consistency of key persons' target effects in IA across groups would be weak but reliably different from zero, however this was not supported. Of the 12 consistency coefficients, only one was reliably different from zero. The level of attraction to a key person in one group was unrelated to the level of attraction to that person in another, and showed that IA was context specific (see Table 4).

There was a different pattern for metaperceptions. Key persons believed that members of non-overlapping groups were similarly attracted to them. In support of Hypothesis 7, of the 9 estimates of the consistency of key persons' perceiver effects in metaperceptions across groups, all were reliably different from zero and were substantial in magnitude ranging from $r = .54$ to $r = .81$ (see Table 5).

Key Persons' Interpersonal Attraction to Others across Groups

Key persons' perceiver effects on the attraction constructs were correlated across groups. These correlations index if one's level attraction to members of one group is related to one's level of attraction to members of a different group. No specific hypothesis was specified. Results indicated that key persons' level of attraction to friends and coworkers were reliably related across groups ranging from $r = .42$ to $r = .45$. All were different from zero. The consistency of key persons' level of attraction to family/friends and family/coworkers was evident but weaker. Estimates in the former ranged from $r = .18$ to $r = .51$ and in the latter ranged from $r = -.01$ to $r = .53$; respectively 25% and 50% of the estimates were reliably different from zero (see Table 6).

ARRMA: Assumed Reciprocity, Reciprocity and Metaperception Accuracy in IA

Assumed reciprocity, reciprocity and metaperception accuracy (parameters b , a , c , respectively of the ARRMA Model) at the individual level were estimated following the initial social relations analysis. From that analysis, relevant effect estimates for indicators of IA constructs were output to a data file for path analysis. These included the perceiver effects in IA, the perceiver effects in metaperceptions of IA, and the target effects in IA. The effect estimates for each of the indicators of a construct were averaged and path models estimated parameters a , b and c for each IA construct within each group. This is the full ARRMA model. Then, assumed and actual reciprocity (parameters a and b) were estimated with the meta-accuracy parameter (parameter c) fixed to zero. This is the restricted model. Fixing the meta-accuracy parameter to zero permitted an assessment of this constraint on model fit. If model fit was not affected adversely, the assumption that meta-accuracy of IA is zero would be supported. If model fit was impaired, this assumption would be untenable and the meta-accuracy of IA would be supported. The unstandardized maximum likelihood estimates of assumed reciprocity, reciprocity and meta-accuracy from the full and restricted models are summarized in Table 7. The chi-square difference for the full and restricted model with 1 df was computed to determine if fixing meta-accuracy (parameter c) to zero impaired model fit. Results showed that at the individual level all estimates of assumed reciprocity and reciprocity were statistically reliable for all attraction constructs, in all groups, in both the full and restricted models. These results supported Hypotheses 8 and 10.

In contrast, meta-accuracy of IA was weaker. Of the 9 estimates in full models, meta-accuracy was observed only in families on the task and physical attraction constructs. Yet, fixing meta-accuracy to zero (parameter c) reliably decreased model fit for 3 out of 9 models (family: task and physical attraction; friends: physical attraction). Constraining meta-accuracy to zero impaired model fit, supporting Hypothesis 12 and its inclusion in ARRMA. Assumed reciprocity of attraction is very strong, reciprocity is weaker but reliable, and accurate awareness of others attraction to oneself is weaker yet, but reliable.

Dyadic Assumed Reciprocity of Interpersonal Attraction

Dyadic assumed reciprocity was observed and results supported Hypothesis 9; people assumed that specific others reciprocated their attraction. The median dyadic assumed reciprocity was $r = .65$ across constructs and groups; all but one estimate was reliable statistically ($r = .24$ among co-workers on task attraction). The social relations analyses showed that across groups and constructs, the statistically reliable estimates of dyadic assumed reciprocity ranged from $r = .39$ to $r = .92$ and are summarized in Table 8. People assumed that specific others were as attracted to them as they were to those others.

Dyadic Reciprocity of Interpersonal Attraction

Hypothesis 11 predicted that dyadic reciprocity would be weak but reliable statistically. The social relations analyses revealed reliable dyadic reciprocity on the social attraction ($r = .53$) construct among family members. There was no reliable dyadic reciprocity in the friend or co-worker groups. Although specific family members reciprocated social attraction, dyadic reciprocity was weak and Hypothesis 11 was not supported (Table 9).

Dyadic Metaperception Accuracy in Interpersonal Attraction

Hypothesis 13 predicted that dyadic meta-accuracy would be weak but reliable statistically; it was not supported. The median dyadic meta-accuracy correlation in the social relations analyses was $r = .19$; the only reliable dyadic meta-accuracy correlation ($r = .60$) was in families on the social attraction construct. Family members knew accurately which family members enjoyed or did not enjoy social interaction with them. In contrast, in the friend and co-worker groups there was no evidence that people accurately knew specific others' attraction to them. These results are summarized in Table 10.

Perceived Similarity and Attraction: Individual and Dyadic

The results confirmed that the similarity – attraction relationship exists at both the individual and the dyadic levels supporting Hypotheses 14 and 15, respectively. At the individual level, average correlations (based on Fisher z transformation) between perceived similarity and attraction on the task, social and physical attraction constructs were $r's = .67, .48$, and $.56$ in the family, friend and co-worker groups, respectively. All were reliable statistically. At the dyadic level, the equivalent average correlations were $r's = .73, .61$ and $.66$ in the family, friend and co-worker groups, respectively; 89% were reliable statistically (see Table 11). If people perceive multiple others or a specific other, as similar to the self, they report greater attraction. A summary of the hypotheses and the empirical outcomes is presented in Table 12.

Discussion

This research provided a comprehensive analysis of dyadic interpersonal attraction among highly acquainted family members, friends and co-workers. It was inspired by mid-twentieth century research when the hearts of the beholder and the beheld were the primary focus of research on social preferences (Tagiuri, 1958). The social relations model guided the specification of new IA phenomena, and precise evaluations of theoretical questions. This research departed from past work that has relied on a single measure of attraction (i.e., liking); modern psychometric models of task, social and physical attraction were implemented.

Interpersonal Attraction at the Individual Level

Variance Components in Interpersonal Attraction within Groups—Kenny (1994) proposed that interpersonal attraction is determined reliably by the perceiver and the target; this was confirmed. Perceiver variance showed that some individuals reported high attraction to group members, whereas others reported less attraction to the same people. These differences among perceivers documented the *heart of the beholder* effect. The effect of the *heart of the beheld*, quantified by target variance, showed that there were consistent differences in attraction to different targets. These and other results (Krause et al., 2014) support Kenny's (1994) prediction. Moreover, the current results are consistent with findings for interpersonal attraction in groups of well-acquainted adolescents (Malloy & Cillessen, 2008) and children (Malloy et al., 1995).

Overall, results show that IA at the individual level is determined simultaneously by the hearts of the beholder (i.e., perceiver) and the beheld (i.e., target). Importantly, and in contrast to most attraction research, participants were highly acquainted (some for decades), and members of the fundamental groups of life. IA was more strongly determined by the heart of the beholder than by the heart of the beheld. Future research should be directed at what factors determine one's perceiver and target effects; that is, what explains individual differences among people in their attraction to those in their daily lives? And, what explains why some elicit attraction while others elicit less attraction? Future research should also address the effect of these psychologically distinct facets of interpersonal attraction on social behavior (e.g. Krause et al., 2014).

Variance Components in Attraction Metaperceptions within Groups—Perceiver variances in metaperceptions were reliable statistically for all constructs in all groups, and confirmed Tagiuri's (1958) prediction of stable individual differences among people in their perceptions of others' attraction to them. The absence of reliable target variance in metaperceptions of attraction is consistent with a substantial body of work on trait perception (Kenny & DePaulo, 1993; Kenny, 1994; Malloy, Albright & Scarpati, 2007). People did not agree that particular members were generally attracted or un-attracted to other members of a group. In no case was a target variance component in metaperceptions reliably different from zero on any attraction construct in any group. A promising un-researched direction is triadic (i.e., A predicts B's attraction to C; Bond, Horn & Kenny, 1997); there may be agreement that one person is uniquely attracted to a specific other person. In work groups, for example, people seem to know who likes and loathes whom. Triadic analysis of interpersonal attraction holds considerable promise.

Consistency of Interpersonal Attraction across Groups—The key person design permitted study of the consistency of individual level processes across groups. Extrapolating from results for 124 key persons and 837 informants from different groups in the U.S., China and Mexico (Malloy et al., 1997; Malloy et al., 2004), I expected that consistency of IA across groups would be weak and this was observed. Of the nine estimates of the consistency of key persons' target effects on attraction across groups; only one was reliably different from zero. In fact, there was less consistency of attraction to key persons across groups than there was for trait judgments (Malloy et al., 1997).

As expected, however, the heart of the beholder effect was consistent across groups. Correlations of key persons' perceiver effects in IA across the friend and co-worker groups were r^2 s = .42, .44, and .45 for the task, social, and physical attraction constructs, respectively. Much weaker consistency was observed across the family and friend groups where estimates did not depart from zero. Across the family and co-worker groups, statistically reliable consistency was observed on the social attraction and physical attraction constructs with correlations of $r = .41$ and $r = .53$, respectively.

Whereas consistency in IA to key persons across groups was essentially absent, key persons showed moderate consistency in their attraction to members of different groups, particularly in the friend and co-worker groups. A parsimonious conclusion may be drawn; the interpersonal attraction of one to many is more consistent than that of many to the one. The

effect of the heart of the beholder is more consistent across groups than is the effect of the heart of the beheld.

Consistency of Metaperceptions of Attraction across Groups—People believe that members of non-overlapping groups judge their traits similarly (Malloy et al., 1997; Malloy et al., 2004); the present results showed that people also believe that members of different groups are similarly attracted to them. The median consistency correlation for key persons' perceiver effect in metaperceptions of attraction across groups was $r = .57$. Although there was no evidence for consistency of attraction to key persons across groups, there was considerable consistency in key persons' predictions of others' attraction to them. This perceived consistency is illusory and reveals a blind spot in interpersonal attraction; people believe that attraction to them is consistent across groups but it is not. The implication of this blind spot for interpersonal behavior is unstudied and worthy of attention.

ARRMA: Individual Level Assumed Reciprocity, Reciprocity and Metaperception Accuracy—The ARRMA model specified the relationship between three attraction phenomena; assumed reciprocity, reciprocity and metaperception accuracy. Tagiuri (1958) proposed a reality model of metaperception of IA that is determined by others' actual attraction to an individual. Tagiuri's prediction is that the accuracy of IA metaperceptions (parameter c) should be reliably different from zero. Tagiuri's (1958) and Kenny's (1994) data on assumed reciprocity of attraction suggested the importance of parameter b of ARRMA. Moreover, Tagiuri's (1958) claim that people predict others' attraction to them based on how those others actually feel, led me to specify the metaperception accuracy parameter (c). The two exogenous variables in the ARRMA model (α_{att} and β_{att}) were specified as causes of metaperception (α_{mp-att}), and, when correlated, estimate reciprocity of IA (parameter a) at the individual level.

Past research failed to confirm the reciprocity hypothesis, and Newcomb (1979, p. 299) concluded its absence was due to "norms about the attraction status of all group members" or μ_k of Equations 1 and 2. In a reanalysis of the Curry and Emerson (1970) data, Kenny and LaVoie (1982) used the SRM to study individual and dyadic reciprocity of attraction among students during the first 8 weeks of acquaintance. They found no evidence for individual reciprocity but did observe dyadic reciprocity. When assumed reciprocity, reciprocity and metaperception accuracy were modeled simultaneously using ARRMA, a clearer theoretical picture emerged. Also important when comparing the present results with past results is the extremely high level of acquaintance among the participants in this study. They knew one another for an extended period in the fundamental groups of life, rather than as new acquaintances in residence halls. Families, friends and co-workers have much greater hedonic relevance for an individual than people who happen to live in one's university residence at the start of a semester (Finkel et al., 2015).

ARRMA produced a systematic pattern of results. Metaperception of others' attraction to one's self are determined most strongly by assumed reciprocity and more weakly by others' consensual attraction to the individual. Importantly, the ARRMA estimates were obtained while controlling for the average level of attraction in a group that Newcomb (1979) believed attenuated reciprocity. Overall, assumed reciprocity was quite robust, replicating

results of Tagiuri (1958) and Kenny (1994), while metaperceptions showed a mix of accuracy and inaccuracy. Metaperception accuracy was observed on the task and physical attractiveness constructs in families. Fixing meta-accuracy to zero adversely affected model fit for physical attraction among friends, and on the task factor among co-workers. Task performance and physical appearance are visible characteristics of another, whereas social attraction is much less apparent. Also, members of families may communicate openly with one another compared with coworkers and friends. If this communication occurs, agreement within the family on these constructs should be strong (Malloy, Agatstein, Yaras & Albright, 1997). Target variance on task and attractiveness constructs in families were both reliably different from zero (.30 and .25, respectively) and showed the strongest level of consensus compared with any other construct, in any other group. The communication process that would lead to this agreement should also produce meta-accuracy. Clearly, the role of communication in the meta-accuracy of attraction in families should be addressed in future research.

A very important finding from ARRMA was the evidence for individual reciprocity on the task, social and physical attraction constructs in all groups. Newcomb (1979) was perplexed by his inability to muster support for the reciprocity hypothesis. From the perspective of componential analysis, this failure was unsurprising; IA was not partitioned into SRM components. Consequently, if assumptions 1 through 4 in the appendix hold, reciprocity would be attenuated.

Kenny and LaVoie (1982) also failed to confirm the reciprocity hypothesis at the individual level of analysis. It may be that individual reciprocity of IA will only emerge in dyads with long standing, established relationships. During relationship formation in a residence hall, for example, acquaintance likely varies substantially across dyads, and reciprocal bonds occur only in dyads with greater acquaintance. This differential acquaintance should promote dyadic reciprocity and attenuate individual reciprocity, and explains the differences between the present findings and those of Kenny and LaVoie (1982).

Interpersonal Attraction at the Dyadic Level

Uniqueness in Interpersonal Attraction within Groups—The early theoretical work on social preferences (Tagiuri, 1958) did not explicitly address the reciprocal responses of dyad members. I believe this was due to an emphasis on the accuracy of social perception that dictated the analytic models in that era (Gage & Cronbach, 1955). The dyadic phenomena conceptualized and estimated here were invisible until the specification of the SRM permitted an explicit focus on them.

Based on data from acquainted individuals, Kenny (1994) showed that approximately 42% of the variance on the variable *liking* was dyadic. As expected, uniqueness variance components in IA were statistically reliable for all constructs in all groups, and the median uniqueness variance across them accounted for 27% of the total variance. Dyadic variances in this study were weaker than reported by Kenny. Most likely, the difference in this and Kenny's (1994) work is explained by the broader range of attraction constructs included, the use of multiple indicators of constructs, and differences in acquaintance. This last possibility will be discussed more fully later. Future IA research should utilize measurement models

based on the psychometric work of McCrosky, McCrosky and Richmond (2006). Going forward, a common set of constructs and indicators is preferred over a single variable (i.e., liking) and offers the opportunity for a nuanced cumulative science of attraction in dyads.

Interpersonal attraction is the glue of social life, and these results confirm that different dyadic constellations produce uniquely high or low attraction. Dyadic attraction was strongest in families, and unique interpersonal responses are not unusual in genetically related people. Mothers, in general, make unique adjustments in their verbal behavior to a child that matches the complexity of the child's speech. In fact, mothers show much greater adjustment of their language to their own child compared to non-genetically related children of the same age (Malloy & Goldfield, 2010). Status also impacts dyadic attraction. When Black and White men interacted face to face in the laboratory for 20 minutes, Blacks displayed unique attraction to specific White men, whereas White men did not differentiate their attraction to two different Black interaction partners (Malloy, Ristikari, Berrios-Candeleria, Lewis & Agatstein, 2011). Future research should broaden the focus to processes in dyads that augment or attenuate unique dyadic IA.

Uniqueness in Metaperception of Attraction within Groups—In 1958, Tagiuri lamented that the uniqueness effect in IA metaperceptions, has “received relatively little of the attention of academic social psychology” (p. 330). Almost six decades later, his lament remains valid with scant theoretical or empirical attention. Highlighting the importance of the present data, the results confirmed that people believe specific others harbor uniquely high or low attraction to them. Across constructs and groups, approximately 23% of the total variance in metaperceptions of IA was determined by processes in specific dyads. However, dyadic metaperceptions were inaccurate and an explanation is discussed below.

Dyadic Assumed Reciprocity, Reciprocity and Meta-Accuracy

Dyadic assumed reciprocity: Across groups and constructs, the median dyadic assumed reciprocity correlation was $r = .65$ and showed that the bias observed at the individual level operates in specific dyads as well. If a person is uniquely attracted to another, the person assumes the other is similarly attracted to them. A very consistent finding here and elsewhere is that assumed reciprocity is a very strong attraction phenomenon at the dyadic and individual levels (Kenny, 1994; Tagiuri, 1958).

Dyadic reciprocity: Available data on dyadic reciprocity of attraction are mixed. In a re-analysis of Curry and Emerson's data (1970), that included unacquainted male and female transfer students to a university, ranging in age from 19–21, Kenny and LaVoie (1982) reported substantial dyadic reciprocity correlations on liking during the first 8 weeks of acquaintance. Yet, dyadic reciprocity in the present study was weak. Differences in methodology and in the level of acquaintance among participants are plausible explanations for the different findings. Curry and Emerson (1970) studied “liking” among groups of 8 strangers during the first 8 weeks in a dormitory with four double rooms. Interactions among the strangers were uncontrolled), and they reported “we did find sub-structuring and response variation within our groups” (p. 220). Acquaintance likely varied considerably in different dyads and led to this “sub-structuring.” In contrast, the groups I studied were

acquainted, on average for 5.26 years; some for decades. This marked difference in acquaintance is another likely basis for the discrepancy of the results. Clearly, more research is needed on dyadic reciprocity of attraction as a function of the length and the nature of interpersonal relationships.

Dyadic meta-accuracy: The psychological illusion that people in different groups are similarly attracted to oneself has direct implications for the level of dyadic meta-accuracy that can be achieved. Statistically, dyadic meta-accuracy is affected by the magnitude of the uniqueness variance in IA ratings and metaperceptions. If either is zero, the dyadic meta-accuracy correlation is constrained to be zero. Across groups and constructs, the median standardized uniqueness variance in metaperceptions of IA was .23, and the median uniqueness variance in IA was .27. All uniqueness variances were reliably different from zero on all constructs in all groups. Thus, it does not seem plausible that dyadic meta-accuracy was constrained statistically. Despite the fact that attraction ratings and metaperceptions were strongly determined by dyadic processes, of the 9 estimates of dyadic meta-accuracy, only one (social attraction in families) was reliable statistically. In spite of the extremely high level of acquaintance in dyads, people did not know accurately specific others' attraction to them. Although people had unique attraction to specific others, and believed that specific others had unique attraction to them, the very strong bias that "everyone is similarly attracted to me" may have precluded dyadic meta-accuracy. Another possibility is that people do not know how attracted to them family, friends and coworkers actually are. In long term relationships cemented by history, people may get very little information about others' attraction to them. Aside from explosive episodes at a holiday dinner, a faculty meeting or during a night out with friends, people may keep their true attraction to others private. Even if one harbors very negative or positive feelings for a group member, they may remain unexpressed because the relationships are formed, unlikely to change and group harmony is preferred over authenticity.

Splitting the Perceived Similarity – Attraction Correlation: Individual and Dyadic—For over five decades, the effect of similarity on attraction has been studied (Byrne, 1971; Newcomb, 1961). People are attracted to those perceived as similar to them; Fiske (2010) dubbed this the similarity-attraction principle. Past research on the similarity - attraction relationship has historically focused on individuals; here it was assessed at both the individual and dyadic levels. In Newcomb's (1961) research, acquaintance increased over the course of the study, yet it was impossible to know if attraction was due to similarity with others generally or similarity with specific others.

The present results demonstrated that the similarity-attraction principle holds among highly acquainted people as evidenced by median correlations at the individual level of r^2 's = .71, .52 and .54 in the family, friend and co-worker groups, respectively. Attraction increased for others who were perceived as similar to the self. Equally robust were correlations at the dyadic level with r^2 's = .69, .68 and .65 in the three groups, respectively. Not only does the perceived similarity-attraction principle hold generally, it holds for specific dyadic combinations. Future research on the effect of similarity on attraction should differentiate the individual and dyadic manifestations of this phenomenon.

General Conclusions

Interpersonal attraction in dyads is affected simultaneously by the *hearts of the beholder*, the *beheld* and their *unique* relationship. This theoretically meaningful componential structure shows that IA should not be reified as a single phenomenon. Rather, conceptually distinct interpersonal attraction phenomena and processes operate simultaneously at multiple levels of analysis. As demonstrated here, dyadic methods permitted assessment of a broad range of unstudied attraction phenomena, while resolving long-standing theoretical quandaries. It is unadvisable to study IA, an inherently dyadic phenomenon, using methods that ignore perceiver, target and uniqueness effects by forcing the analysis to only one level (Reis et al., 2011). Malloy and Kenny (1986) discussed the theoretical and empirical limitations of this approach.

Future research should focus on different attraction phenomena in different relationship contexts that afford different interpersonal responses within them (McArthur & Baron, 1983). Much attraction research has been conducted in relationships where dyad members have low acquaintance and little interpersonal relevance. Research that considers attraction in contexts that afford different interpersonal responses among people with different relationship goals is warranted (Finkel & Eastwick, 2015). Different facets of attraction (task, social, physical) will be more or less relevant in different interpersonal contexts; consequently, more nuanced measurement of attraction is preferred over a single measure of liking.

The estimates of consistency across groups were based on 25 key persons; larger samples using the key person design is warranted. However, the present results are very consistent with results across three samples with 124 key persons; there was consensus in trait judgments within groups and relatively weak agreement in trait judgments of key persons across groups. Reminiscent of findings for trait judgments (Malloy et al., 1997; Malloy et al., 2004), people believed that members of different groups were similarly attracted to them when, in fact, they were not. This illusion regarding others attraction to the self is even stronger than the analogous finding in trait perception research. The implication of this illusion for social relationships is unknown and a promising future direction.

ARRMA offered a single model of three attraction phenomena. It confirmed that assumed similarity is ubiquitous while providing the first evidence for individual reciprocity. Results from ARRMA also confirmed that meta-accuracy of attraction among individuals does occur. It would be informative to consider moderators of ARRMA parameters so that boundary conditions for these phenomena can be established.

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Appendix

Why Un-Decomposed Scores should not be used to Estimate Consistency of IA across Groups

If consistency of IA to the key person across groups is estimated using un-decomposed scores, X_{ita} and X_{jtb} of equations 4 and 5, the evidence for consistency is biased toward zero. This bias will result if the following expectations (ϵ) for component covariances (C) hold across groups:

$$\epsilon C(\mu_a \mu_b) = 0 \quad (\text{Assumption 1})$$

$$\epsilon C(\alpha_{ia} \alpha_{jb}) = 0 \quad (\text{Assumption 2})$$

$$\epsilon C(\gamma_{ita} \gamma_{jtb}) = 0 \quad (\text{Assumption 3})$$

$$\epsilon C(\epsilon_{ita} \epsilon_{jtb}) = 0 \quad (\text{Assumption 4})$$

Assumption 1 states that people do not selectively join different groups that are similar on a dimension (e.g. high or low attraction); therefore the expected value of the covariance of μ_a and μ_b is 0 (see Kenny, et al., 2006). Second, if i and j of a and b represent a random pairing of members from two groups, the expected value of covariances of i 's and j 's perceiver and uniqueness effects are 0 (Assumptions 2 and 3, respectively). Third, by definition the covariance of error components of i 's and j 's responses equals zero (Assumption 4). Estimates of consistency produced by the covariance of undecomposed variables, that is $C(X_{ita}, X_{jtb})$, are suboptimal because the component covariances (Assumptions 1 through 4) assumed to be zero will attenuate the estimate of the consistency coefficient. This is why the covariance of β_{ia} and β_{jb} is the preferred estimate of the consistency of a key person's target effect in IA across groups. Similar logic applies to the estimation of the consistency of key persons' perceiver effects in IA across groups.

Formal Specification of the ARMA Model

The ARMA model in Figure 2 (assuming no error to simplify), may be expressed as:

$$\alpha_{mp} = b\alpha_{att} + c\beta_{att} \quad (6)$$

where α_{mp} is the perceiver effect in metaperceptions of IA, α_{att} is the perceiver effect in IA and β_{att} is the partner effect in IA. Assumed reciprocity (parameter b) is:

$$\rho\alpha_{att}\alpha_{mp} = b + c(\rho\alpha_{att}\beta_{att}) \quad (7)$$

where ρ is the population correlation. Individual meta-accuracy (parameter c) is estimated by:

$$\rho\beta_{att}\alpha_{mp} = c + b(\rho\alpha_{att}\beta_{att}) \quad (8)$$

Reciprocity (parameter a) is the correlation of α_{att} and β_{att} , that is, $\rho\alpha_{att}\beta_{att}$.

A solution for parameter b (i.e., the bias model of metaperceptions in IA) is provided by:

$$b = \frac{\rho\alpha_{att}\alpha_{mp} - (\rho\alpha_{att}\beta_{att})(\rho\beta_{att}\alpha_{mp})}{1 - (\rho\alpha_{att}\beta_{att})^2} \quad (9)$$

This states that the effect of one's perceiver effect in IA on one's metaperception of IA is equal to assumed reciprocity minus the product of reciprocity and meta-accuracy, divided by 1 minus reciprocity squared. If assumed reciprocity is strong and reciprocity is weaker, parameter b should be a substantial determinant of metaperception of IA.

An estimate of Tagiuri's (1958) prediction (i.e., a reality model of metaperception) is provided by the estimate of parameter c .

$$c = \frac{\rho\beta_{att}\alpha_{mp} - (\rho\alpha_{att}\beta_{att})(\rho\alpha_{att}\alpha_{mp})}{1 - (\rho\alpha_{att}\beta_{att})^2} \quad (10)$$

This states that the impact of one's target effect in IA on one's metaperception of IA is equal to the accuracy of metaperception minus the product of reciprocity and assumed reciprocity, divided by 1 minus reciprocity squared. If metaperception of IA is determined by others' actual attraction to a person, as predicted by Tagiuri (1958), parameter c should be greater than parameter b .

The predictions for ARRMA parameters in equations 9 and 10 are informed by actual empirical findings showing that assumed reciprocity is quite strong and inaccurate (Kenny, 1994; Tagiuri, 1958). Yet, ARRMA is also capable of explaining the case when others' consensual attraction to a person (β_{att}) is equal to one's general attraction to others (α_{att}), and both impact one's perceiver effect in metaperception of IA. While empirically unobserved, this would be a case when ARRMA would show that reciprocity, assumed reciprocity and the accuracy of metaperception in IA are all related perfectly.

Figure 1.
Key Person Design

Figure 2.
ARRMA model of Assumed Reciprocity (b), Reciprocity (a), and Metaperception Accuracy (c) at the individual level of analysis.

Table 1

Psychological Interpretation of Terms and Variance Components in Interpersonal Attraction and Metaperception of Attraction

Interpersonal Attraction		
<i>Term</i>	<i>Level of Analysis</i>	<i>Psychological Interpretation</i>
Elevation (μ)	Group	Mean level of attraction in a group
Error (ϵ)	Individual	Random error in attraction
<i>Variance Component</i>	<i>Level of Analysis</i>	<i>Psychological Interpretation</i>
Perceiver (σ_a^2)	Individual	Individual differences in attraction to the same set of group members
Target (σ_β^2)	Individual	Individual differences among targets in consensual attraction to them by group members
Uniqueness (σ_γ^2)	Dyad	Unique attraction of one person to a specific other person in different dyads

Metaperceptions of Interpersonal Attraction		
Term	Level of Analysis	Psychological Interpretation
Elevation (μ)	Group	Mean level of predicted attraction to the self in a group
Random Error (ϵ)	Individual	Random error in metaperception of attraction
Variance Component	Level of Analysis	Psychological Interpretation
Perceiver (σ_a^2)	Individual	Individual differences among group members in predictions of others' attraction to the self
Target (σ_β^2)	Individual	Consensual judgments that different targets are generally attracted to or un-attracted to others
Uniqueness (σ_γ^2)	Dyad	Individuals' perceptions that specific individuals are uniquely attracted to them in different dyads

Table 2

Interpersonal Attraction and Perceived Similarity: Variance Components for Constructs within Groups

Family				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.13 *	.30 *	.20 *	6.02
Social	.16 *	.09	.26 *	5.92
Physical Attraction	.39 *	.25 *	.22 *	6.20
Perceived Similarity	.24 *	.05	.26 *	5.25
Friend				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.19 *	.11 *	.34 *	6.09
Social	.16 *	.09 *	.27 *	6.27
Physical Attraction	.19 *	.22 *	.40 *	5.88
Perceived Similarity	.26 *	.04	.26 *	5.40
Co-Worker				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.18 *	.19 *	.30 *	6.16
Social	.16 *	.06	.24 *	5.84
Physical Attraction	.22 *	.12 *	.36 *	5.70
Perceived Similarity	.21 *	.00	.27 *	5.14

Note. Entries are standardized variance components.

*
 $p < .05$

Means are in a 7 (1–7) point metric.

Table 3

Metaperceptions of Interpersonal Attraction and Perceived Similarity: Variance Components within Groups

Family				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.28 *	.04	.23 *	6.08
Social	.16 *	.00	.34 *	5.90
Physical Attraction	.41 *	.06	.31 *	6.00
Perceived Similarity	.25 *	.00	.30 *	5.24
Friend				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.47 *	.02	.22 *	6.01
Social	.25 *	.04	.21 *	6.20
Physical Attractive	.44 *	.03	.27 *	5.61
Perceived Similarity	.32 *	.02	.26 *	5.42
Co-Worker				
Constructs	Perceiver	Target	Uniqueness	Elevation (Mean)
Task/Work	.36 *	.00	.23 *	6.14
Social	.25 *	.05	.16 *	5.65
Physical Attraction	.43 *	.05	.13 *	5.42
Perceived Similarity	.20 *	.00	.32 *	5.13

Note. Entries are standardized variance components.

*
 $p < .05$

Means are in a 7 point metric.

Table 4

Consistency of Attraction to Key Persons across Non-Overlapping Groups

Construct	FA-FR	FA-CO	FR-CO
Task/Work	.26	.32	.24
Social	.26	.37 [*]	-.01
Physical Attraction	.04	.15	.07

Note. Entries are correlations of key persons' target effects (β) in IA constructs across groups. FA is family, FR is friend and Co is Coworker.

^{*}
 $p < .05$

Table 5

Consistency of Key Persons' Perceiver Effects in Metaperceptions of Attraction across Non-Overlapping Groups

Constructs	FA-FR	FA-CO	FR-CO
Task/Work	.60 [*]	.54 [*]	.57 [*]
Social	.56 [*]	.60 [*]	.57 [*]
Physical Attraction	.54 [*]	.81 [*]	.70 [*]

Note. Entries are correlations of key persons' perceiver effects (α) in metaperceptions in IA constructs across groups. FA is family, FR is friend and Co is Coworker.

^{*}
 $p < .05$

Table 6

Consistency of Key Persons' Perceiver Effects in Attraction across Non-Overlapping Groups

Construct	FA-FR	FA-CO	FR-CO
Task/Work	.18	-.01	.42 *
Social	.30	.41 *	.44 *
Physical Attraction	.24	.53 *	.45 *

Note. Entries are correlations of Key Persons' estimated perceiver effects (α) in IA constructs across non-overlapping groups. FA is family, FR is friend and Co is Coworker.

*
 $p < .05$

Table 7

ARRMA: Assumed Reciprocity, Reciprocity and Meta-Accuracy of Attraction at the Individual Level

Family				
Constructs	Assumed Reciprocity	Reciprocity	Meta-Accuracy	χ^2 (1df)
Task: Full	.72* (.06)	.35* (.08)	.20* (.06)	11.86*
Task: Restricted	.83* (.06)	#	##	
Social: Full	.87* (.06)	.56* (.10)	.04 (.06)	.43
Social: Restricted	.90* (.04)	#	##	
Physical Attraction: Full	.36* (.07)	.25* (.08)	.61* (.09)	38.75*
Physical Attraction: Restricted	.54* (.08)	#	##	
Friends				
Constructs	Assumed Reciprocity	Reciprocity	Meta-Accuracy	χ^2 (1df)
Task: Full	.75* (.09)	.38* (.07)	.12 (.09)	1.62
Task: Restricted	.83* (.07)	#	##	
Social: Full	.90* (.08)	.24* (.05)	.03 (.09)	.10
Social: Restricted	.91* (.06)	#	##	
Physical Attraction: Full	.57* (.09)	.34* (.07)	.26 (.12)	4.70*
Physical Attraction: Restricted	.68* (.08)	#	##	
Co-Workers				
Constructs	Assumed Reciprocity	Reciprocity	Meta-Accuracy	χ^2 (1df)
Task: Full	.54* (.09)	.49* (.09)	.21 (.09)	5.71*
Task: Restricted	.69* (.06)	#	##	
Social: Full	.93* (.07)	.53* (.09)	-.02 (.07)	.06
Social: Restricted	.92* (.05)	#	##	
Physical Attraction: Full	.52* (.09)	.61* (.11)	.10 (.10)	1.05
Physical Attraction: Restricted	.58* (.07)	#	##	

Note. Entries are unstandardized path coefficients (1 – 7 metric).

 χ^2 is the change in chi square with the meta-accuracy parameter c of the ARRMA model constrained to zero.* $p < .05$

parameter estimates are identical in the full and restricted models

parameter fixed to zero in restricted models

Table 8

Dyadic Assumed Reciprocity of Interpersonal Attraction

Construct	Family	Friends	Co-Workers
Task	.65 *	.62 *	.24
Social	.92 *	.89 *	.83 *
Physical Attraction	.40 *	.72 *	.39 *

Note. Entries are correlations of the individuals' uniqueness effects in attraction ratings and uniqueness effects in metaperceptions.

*
 $p < .05$

Table 9

Dyadic Reciprocity: Interpersonal Attraction and Metaperceptions of Interpersonal Attraction

Family		
Construct	Interpersonal IA	Metaperceptions of IA
Task	.08	.37 *
Social	.53 *	.72 *
Physical Attraction	-.10	.05
Friend		
Construct	Interpersonal IA	Metaperceptions of IA
Task	.01	-.03
Social	.13	.26
Physical Attraction	.05	.01
Co-Worker		
Construct	Interpersonal IA	Metaperceptions of IA
Task	-.25	.03
Social	-.01	-.03
Physical Attraction	.28	.10

Note. Entries are dyadic reciprocity correlations of uniqueness effects in interpersonal attraction ratings and metaperceptions.

*
 $p < .05$

Table 10**Dyadic Meta-Accuracy of Interpersonal Attraction**

Constructs	Family	Friend	Co-Worker
Task	.19	.00	.24
Social	.60 *	.22	.09
Physical Attraction	.14	.08	.32

Note. Entries are dyadic meta-accuracy correlations of uniqueness effects in meta-perceptions and uniqueness effects in rated attraction.

*
 $p < .05$

Table 11

Perceived Similarity - Attraction Correlations: Individual and Dyadic

Family		
Construct	Individual	Dyadic: Intrapersonal
Task	.73 *	.69 *
Social	.71 *	.90 *
Physical Attraction	.54 *	.45 *
Friend		
Construct	Individual	Dyadic: Intrapersonal
Task	.40 *	.68 *
Social	.52 *	.74 *
Physical Attraction	.52 *	.32
Co-Worker		
Construct	Individual	Dyadic: Intrapersonal
Task	.53 *	.57 *
Social	.60 *	.74 *
Physical Attraction	.54 *	.65 *

Note. Individual level involves perceiver effects in similarity and perceiver effects in attraction, dyadic involve intrapersonal uniqueness effects in similarity and intrapersonal uniqueness effects in attraction.

*
 $p < .05$

Table 12

Summary of the Empirical Findings

Attraction within Groups			
Hypothesis		Empirical Finding	Phenomenon
1	$\sigma_a^2 > 0$	supported	perceiver variance
2	$\sigma_\beta^2 > 0$	supported	target variance
3	$\sigma_\gamma^2 > 0$	supported	uniqueness variance
Attraction Metaperceptions within Groups			
4	$\sigma_a^2 > 0$	supported	perceiver variance
5	$\sigma_\gamma^2 > 0$	supported	uniqueness variance
Consistency of Attraction across Groups			
6	$\rho\beta_{ta}\beta_{tb} > 0$	not supported	consistency of Key Persons' target effects
7	$\rho\alpha_{tmapa}\alpha_{tmapb} > 0$	supported	consistency of Key Persons' perceiver effects in MP
Reciprocity of Attraction			
8	$\rho\alpha_{att}\alpha_{mp} > 0$	supported	individual assumed reciprocity
9	$\rho\gamma_{att}\gamma_{mp} > 0$	supported	dyadic assumed reciprocity
10	$\rho\alpha_{att}\beta_{att} > 0$	supported	individual reciprocity
11	$\rho\gamma_{ij}\gamma_{ji} > 0$	not supported	dyadic reciprocity
Accuracy of Metaperception			
12	$\rho\alpha_{att,mp}\beta_{att} > 0$	supported	individual accuracy of MP
13	$\rho\gamma_{att,mp}\gamma_{att} > 0$	not supported	dyadic accuracy of MP
Perceived Similarity - Attraction			
14	$\rho\alpha_{sim}\alpha_{att} > 0$	supported	individual perceived similarity – attraction
15	$\rho\gamma_{sim}\gamma_{att} > 0$	supported	dyadic perceived similarity - attraction