



For Love and LEGO: Validating a Three-Dimensional Measure of Intimacy and Closeness

Word Count: 7996

Master of Science in Social Psychology

The University of Edinburgh

2019

Abstract

Intimacy and closeness is an essential and consequential part of human social life. While explicit measures have proven useful to this understanding, they cannot approach all aspects of intimacy and closeness. However, understanding intimacy and closeness from an implicit perspective has proven difficult because most current implicit measures lack standardized quantitative coding, are logistically difficult, or measure an aspect related to intimacy and closeness but is not itself intimacy and closeness (e.g. attitudes). This study sought to develop and validate a novel, three-dimensional measure of intimacy and closeness using LEGO that bridges that measurement gap. 77 participants created a scene of themselves and a close other using LEGO in-lab. The distance between the LEGO figures that participants placed predicted intimacy and closeness above and beyond that of other antecedents of intimacy and closeness (e.g. intimacy motive) and was distinct from the corresponding explicit measure in reliability analyses. Future work to explore the multi-functional data available from the LEGO task and further examine the nature and validity of the measure are discussed. Particular attention is placed on examining how direct/indirect the LEGO task is and more deeply investigating its implicit/explicit nature.

Keywords: Intimacy and Closeness, Measures, LEGO, Implicit/Explicit, Close Others

Introduction

Humans are intrinsically motivated to form and maintain social attachments with each other, going through various cognitive and behavioral adaptations throughout their lives and different social situations to achieve certain levels of closeness with others (Baumeister & Leary, 1995; Gray, Ishii, Ambady, 2011; Mackenzie & Baumeister, 2019). Indeed, these intrinsic motivations contribute to the formation and maintenance of all manners of human relationships, relationships that, in turn, form salient aspects of people's lived-in experience. Although social psychologists have developed well-validated explicit measures that assess how intimate and close individuals feel with one another, implicit measures of intimacy and closeness are comparatively underdeveloped. Most implicit measures of intimacy and closeness end up being difficult to code in a standardized, quantitative way (McAdams, 1980; McClelland, Atkinson, Clark, & Lowell, 1953), are logistically difficult to assess (Hagemeyer & Neyer, 2012; McNulty, Baker & Olson, 2014), or overgeneralize a specific aspect of intimacy and closeness to represent the entire construct (Banse & Kowalick, 2008; Axt, Nguyen, & Nosek, 2018). The current research sought to develop and validate a novel, three-dimensional measure of implicit intimacy and closeness that addresses the limitations of prior measures.

Explicit and Implicit Measures

Psychological measures can be divided into two major categories: explicit and implicit. Historically, psychology has predominantly leaned on explicit self-report scales and questionnaires (Cunningham, Preacher, & Banaji, 2001). However, these explicit measures are influenced by participants tendency for impression management, for example responding to questionnaires in socially desirable ways to present favorable images of themselves (Van de Mortel, 2008). Critically, such measures assume that individuals are able and motivated to accurately report their thoughts and beliefs; in other words, that people can, and will choose to, correctly access the kind of psychological constructs researchers are interested in. A movement of social cognition research in the 1990s through early 2000s called such assumptions into question, demonstrating that explicit measures do not fully capture constructs like self-esteem, attitudes, and stereotypes (Fazio, Jackson, Dunton, & Williams, 1995; Greenwald & Banaji, 1995). Researchers turned to newly developed "implicit measures" to circumvent social desirability issues in self-reports and tap into psychology beyond conscious access (Banaji, 2001;

Cunningham et al., 2001). With recent challenges to the notion such constructs are truly inaccessible to people (Hahn, Judd, Hirsh, & Blair, 2014), the meaning of the term “implicit” has evolved into something slightly more well-rounded than its original usage. For example, while there is evidence people may have awareness of implicit attitudes, it is still the case that people tend to lack awareness of how said attitudes manifest (e.g. behavioral impact; Banse & Imhoff, 2013; Gawronski & Bodenhausen, 2006). The modern core definition of “implicit” refers to some attribute that influences the measured outcome in an automatic, uncontrolled way (Hahn & Gawronski, 2017). The goal is that tapping into these implicit responses reveals meaningful information about difficult-to-assess constructs without the biases that frequently accompany explicit measures.

It bears mentioning that the field continues to debate the exact usage and place of implicit measures. Several meta-analyses have revealed a complex relationship between explicit and implicit measures. Implicit and explicit measures tend to correlate weakly, however they do so in unreliable ways such that it remains difficult to ascertain their exact relationship with each other (Hofmann et al., 2005; Kurdi et al., 2018). However, that research also showed implicit measures reliably predict behaviors, which has thus far been taken as a strong argument for their continued usage. Much like how different methodologies can reveal different aspects of the same construct (Jacobvitz, Curran, & Moller, 2002), explicit and implicit measures tend to predict different outcomes (Hagemeyer, Dufner, & Denissen, 2016; Wegner, Bohnacker, Mempel, Teubel, & Schuler, 2014). For example, McNulty et al. (2014) found that implicit, not explicit, self-evaluations predicted evaluations in marriages over time. This notion that implicit measures reveal information about a construct like relationships, above and beyond that of explicit measures, is a recurring theme in the literature (Hicks & McNulty, 2019). So, while implicit measures hold a complex position in psychological research, they reveal information about constructs that are otherwise difficult to assess via self-report such as intimacy and closeness.

What is Intimacy and Closeness?

Intimacy and closeness has been studied in many different contexts. For example, intimacy and closeness within romantic relationships is commonly understood as components of love, personal validation, trust, and self-disclosure (Hook et al., 2011), and feelings of being deeply understood by another (Lippert & Prager, 2001). Meanwhile, within friendships, research

suggests that intimacy and closeness is based on the prototypicality of the relationship (e.g. how bidirectional both individuals expect their relationship to be; Mashek & Aron, 2004b). To distinguish it from the more romantically connotated usage of the term “intimacy” and smooth over inconsistent usage of terminology in the literature, this paper will default to the terms “intimacy and closeness” as per Mashek & Aron (2004a) to describe the warm, close social connections people have in both romantic and platonic relationships.

The importance of intimacy and closeness is perhaps most apparent when observing the effects of its absence. Research on isolation and loneliness suggests that individuals have a sort of ‘quota’ for social connection with others that affects their perceptions of their relationships (Waytz, & Epley, 2012) and, if lacking, facilitates social reconnection (Maner, DeWall, Baumeister, & Schaller, 2007). Indeed, this need for social (re)connection is found on behavioral, cognitive, and biological levels (DeWall, & Richman, 2011). For example, socially rejected people overly project warm intentions onto the giver of a gift and feel more grateful than those who are not socially rejected (Mackenzie & Baumeister, 2019). Moreover, when people are socially disconnected, they rate inanimate faces as more “alive” and human-like (Powers, Worsham, Freeman, Wheatley, & Heatherton, 2014). This suggests an adaptive motivation to connect with others and maximize opportunities for relationships when intimacy and closeness is left wanting. Other research has observed that social loss, and the sadness that accompanies it, motivates people towards other social connection (Gray et al., 2011). Social responsiveness is apparent on a biological level as well; progesterone, a hormone associated with social affiliation, fluctuates in response to social exclusion (Maner, Miller, Schmidt, & Eckel, 2010). In summary, the lack of strong, stable relationships is linked to various negative effects on health and well-being (Baumeister & Leary, 1995).

Most of what is known about implicit intimacy and closeness comes from two different approaches: implicit motives and attitudes. In these contexts, implicit motivation refers to the unconscious motivational needs that orient, select, and energize behavior (Schultheiss, & Pang, 2007). The motive to have and curate intimacy and closeness originally emerged from the study of affiliation, originally defined as the establishing and curating of positive relationships (Atkinson, Heyns, & Veroff, 1954). As an example, this ‘affiliation’ is the kind of connection that can be formed when listening to or participating in music with strangers (Vuokoski, Clarke, & DeNora, 2017). The *motive* towards that affiliation is linked to cordial, nonverbal socializing

behaviors with strangers or even members of opposing groups (Hagemeyer et al., 2016, McAdams, Jackson, & Kirshnit, 1984; Wegner et al., 2014). In slight contrast, the intimacy and closeness motive distinguished itself as a deeper kind of social connection, being the motivation towards a warm, close, and communicative exchange with another (McAdams & Constantian, 1983). McAdams and Constantian's work (1983) thus suggests a minor distinction between affiliation and intimacy and closeness; that is, while they manifest quite similarly, an intimacy motive leads to stronger effects than an affiliation motive. However, the study of these two motives have overlapped in the intervening years, with emerging debates about whether they may be reflecting variations within the same construct (Hofer & Hagemeyer, 2018). The intimacy and closeness motive reflects an important perspective on the larger intimacy and closeness construct: there is individual variation in intimacy and closeness. Intimacy and closeness vary between relationships, can evolve within relationships, and can differ between people because of individual motivational differences.

The second major component of implicit intimacy and closeness literature comes from implicit attitudes. The interest in attitudes in this interpersonal literature originally stemmed from an enthusiasm to adopt implicit measures, driven in large part by the popular reaction-time IAT system (Greenwald & Banaji, 1995). Consequently, much of what is known about implicit intimacy and closeness (via implicit attitudes) has been studied with similar perspectives and tools. McNulty and colleagues, for instance, used reaction-based responses about attitudes towards their romantic partner after priming them with photos of their partner (McNulty, Olson, Meltzer, & Shaffer, 2013). They found that those implicit attitudes predicted marital satisfaction above and beyond that of explicit attitude measures over four years. Implicit attitudes of intimacy and closeness have also been shown to be related to behaviors and relationships outcomes in daily life. Diary studies show that implicit evaluations of a partner are stronger predictors of relationship quality and relationship-promoting behaviors than explicit evaluations (LeBel & Campbell, 2012). Moreover, implicit evaluations of a partner during stressful life events, like pregnancy, predicted wellbeing over and above explicit evaluations (Banse & Kowalick, 2007). It is not just implicit evaluations of others that reflect interpersonal relationships. Implicit evaluations of the self can also predict changes in implicit evaluations of partners (McNulty et al., 2014). In other words, implicit attitudes can, in various ways, contribute

to how people interact in social situations and frame the intimacy and closeness of their relationships.

In summary, implicit affiliation and implicit attitudes are uniquely important to relationships with close others. Not everyone has the same social need for intimacy and closeness and mere affiliation is generally not enough to fulfill said need. Relationships can also change in the extent to which they are (or are not) intimate and close. Additionally, implicit evaluations of oneself and others have shown to be linked to important components in close relationships. However, while abundantly relevant to intimacy and closeness, these implicit approaches are not technically measures of intimacy and closeness. The *motive* to be intimate and close with others, and how people think and feel about being intimate and close with others (*attitudes*), are not themselves intimacy and closeness. Meanwhile, there are general limitations of explicit measures in assessing constructs (e.g. impression management; Greenwald & Banaji, 1995; Van de Mortel, 2008), and explicit measures inherently reflect a different part of the same construct as a congruent implicit measure (Hagemeyer et al., 2016). Therefore, it is important to consider new implicit measures of intimacy and closeness, both to more accurately represent the construct, and to contribute to a more balanced narrative of intimacy and closeness alongside explicit measures.

Introducing a Novel, Three-Dimensional Measure of Implicit Closeness

Existing implicit measures of intimacy and closeness are somewhat problematic in practice for several reasons. To start, many measures rely on approaches that are logistically taxing and lack robust standardized, quantitative measurement. Many implicit measures of intimacy and closeness have tried to circumvent consciously accessed aspects by turning to artistic measures. One of the original implicit measures utilized to assess intimacy and closeness was the Thematic Apperception Test (TAT) of intimacy, requiring participants to write stories about themselves and a close other in different situations (McAdams, 1980; Murray, 1943). Alterations on this method like the Picture-Story Exercise (PSE; McClelland et al., 1953) and the modern tests it inspired like the Partner-Related Agency and Communion Test (PACT) have participants create mini stories based on ambiguous pictures (Hagemeyer & Neyer, 2012). The strategic usage of these artistic directions to tap into less consciously accessed psychology is one of the most common fixtures in these implicit measures. However, these tests are consequentially

quite effortful and time-consuming, both for participants to complete and for researchers to code. The most widely utilized coding scheme is Winter's (1994) unpublished manual for scoring textual responses to imagery, which requires intensive training to use properly. Meanwhile, the PSE is inconsistent and, while new adaptations better account for such individual variation (Schultheiss, Liening, & Schad, 2008), the test remains logistically effortful to perform, train for, and analyze in a standardized way. Regardless, reviewing hundreds of stories and pictures from the exercise remains highly effortful.

Other common implicit tests tailored to intimacy and closeness overgeneralize specific aspects of the construct. Many of these implicit tests rely on extrapolating intimacy and closeness from positive or negative feelings. The Partner-IAT, for example, is an IAT measuring participants' reaction times in associating positive and negative words to partner-stranger labels (Banse & Kowalick, 2007). The idea, much like that of the original IAT, is that people more quickly associate more congruent associations (e.g. partner-good, stranger-bad) than dissonant associations (partner-bad, stranger-good; Greenwald & Banaji, 1995). This kind of reflex-based system, where a stimulus relating to a close other must be quickly sorted as good/bad, is a common one. Tests like the associative priming tasks (Fazio et al., 1995; McNulty et al., 2013), the Judgement Bias Task (JBT; Axt et al., 2018), and the Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005) all use a similar setup. However, this valence-based test does not assess intimacy and closeness directly. While it is plausible that stronger "good" or "bad" associations with a partner may reflect a level of intimacy and closeness, it is not necessarily the case they are intimacy and closeness. As such, these implicit methods may reveal important information *about* intimacy and closeness but are shy of being methods *of* intimacy and closeness.

Lesser-known tests that have tried measuring intimacy and closeness in more accessible and direct ways have focused on three-dimensional arts. Gehring and Wyler (1986) developed a method for quantitatively measuring closeness in family relationships, the Family-System-Test (FAST), using a chessboard layout with figurines. They attempted to quantitatively encapsulate multiple dimensions of family dynamics based on distance and the positioning of the figures that was accessible to researcher and participant (which, in their case, included children). Later versions of the FAST built upon its strength as an accessible, quantitative measure by introducing more lifelike figures and more aspects to measure from the scenes (Compagnone,

2009; Paul, 2019). For example, Compagnone (2009) developed a successor called the Systemic Analysis of Group Affiliation (SAGA) which introduced more precise coding of how to measure proximal distance between figures using a ruler rather than squares and also included records of where figures were facing.

However, the FAST-based system remains an imprecise measure that poorly reflects adult interpersonal relationships. To start, they lack standardized, quantitative precision. While more precise than the squares of the original FAST, even the SAGA measures in decimeters (0.1 meters) and lacks a consistently specific way to measure distances (i.e. measuring from what point of the figure to what point of the other). This limits the variation captured by the tests and increases measurement margins of error. Secondly, both tests are designed to capture family unit dynamics by situating participants in given scenes that do not describe the as-is relationships between individuals. They do so by asking participants to represent a family dynamic in an uncommonplace setting (e.g. a ‘conflict’ situation) to examine the nature of the family unit by seeing how cohesiveness changes per each situation. However, this means that scores do not reflect how participants generally conceive of their relationships. Thirdly, the FAST and SAGA are direct measures. They make no allusions of the construct they are intending to measure—they directly ask participants to create scenes for the endeavor of understanding their family dynamics. In other words, the FAST and SAGA are not robust implicit measures of intimacy and closeness, nor do they intend to be. However, they offer the groundwork that, if expanded upon, can build upon past implicit attempts at measuring intimacy and closeness.

A LEGO-based measure may be a bridge between past hurdles and successes by capturing multiple aspects of intimacy and closeness in an accessible, quantitatively standardized way. LEGO, as an artistic three-dimensional medium, may similarly circumvent more consciously controlled processes, much like how past writing, drawing, and picture-based measures have (Hagemeyer & Neyer, 2012; McAdams, 1980; McClelland et al., 1953; Murray, 1943). Previous research suggests that the distance people aim to put between themselves and others can implicitly reflect interpersonal aspects of a relationship (Dewitte & De Houwer, 2008). The distance between the self and close other in a LEGO scene may serve as an indicator of intimacy and closeness. While the FAST, and its later iterations, have already included actor-partner distance (Gehring and Wyler, 1986), distances measured in units of LEGO studs (approximately 0.008 meters) offer more precise measurement than distances in units of

chessboard-sized squares or decimeters. Three-dimensionality also lends itself to capturing other aspects of intimacy and closeness, such as information about body position and eye-contact of both the actor and partner. Though still unclear what outcomes these aspects might map onto, individual ‘body language’ data is a step towards including the dyadic nature of relationships in the context of intimacy and closeness. These measures, it should be remembered, show how participants see the relationship, as well as how they perceive their partner is within it too. Considering the interdependence of individuals in a relationship, and the importance of considering those bidirectional effects (Cook & Kenny, 2005), it is a strength of the LEGO task that it can include actor-partner dynamics. Moreover, LEGOs are an accessible set of tools for participants and researchers. For participants, they avoid potential skill-based tasks like creative writing that some may find aversive. For researchers, a LEGO task is relatively simple to set up, easy to run, and quicker to code in large quantities than stories or pictures. Overall, this LEGO task has potential as an adaptable implicit measure that encompasses multiple avenues of approaching intimacy and closeness.

Research Overview and Hypotheses

The goal of this study was to develop and validate an implicit measure of intimacy and closeness. As the first project exploring this proposed measure, this study is an exploratory pilot that trials using a three-dimensional measure in practice and evaluates its ability to measure intimacy and closeness.

Confirmatory Predictions/Analyses

While previous research suggests that implicit and explicit measures correlate weakly, if at all (deCharms et al., 1955, Spangler, 1992), more recent meta-analyses suggest consistent, small-medium correlations (e.g., Kurdi et al., 2018). Thus, we expect that explicit and implicit measures of closeness will be weakly correlated with each other.

Exploratory Predictions/Analyses

Because the LEGO task is new, it is unclear what aspects of intimacy and closeness (if any) will be captured by it. For this reason, we make no firm *a priori* predictions about what aspects of intimacy and closeness captured by the LEGO task will predict the results of other implicit or explicit measures utilized in this study.

Method

Preregistration and Ethics

This study was preregistered on the Open Science Framework at osf.io/jv563/ (Hajnosz & Stanton, 2019, July 8). The study obtained ethical approval from the University of Edinburgh's Philosophy, Psychology, and Language Sciences Research Ethics Committee (application number 414-1819/1).

Participants

Recognizing that close relationships are varied, all adults fluent in English were eligible to participate. The sample comprised 77 individuals (48 women) who each received £3.00 for their participation in the study. Participants were 20-79 years old ($M = 33.20$, $SD = 18.13$) and 87% were heterosexual. The sample was 65% White/Caucasian/Anglo, 12% East Asian, 8% Mixed or Multiple Ethnicities, 5% South Asian, 5% Southeast Asian, 1% Black/African/Caribbean, 1% Hispanic/Latino/a/Chicano/a, and 3% felt their race/ethnicity was not represented by the options. Participants were asked to include the initials of someone they were close to. Participants had several typical relationships with their close others (28.6% Friend, 32.5% Partner/Spouse/Significant Other, 35.1% Immediate Family Member, 3.8% Other). Participants had known their close other for 3-775 months ($M_{\text{months}} = 209.3$, $SD_{\text{months}} = 197.8$).

Measures

Desire for acceptance and belonging. Participants completed the 10-item Need to Belong Scale (Leary, Kelly, Cottrell, & Schreindorger, 2013) to assess the extent participants desired acceptance and belonging (e.g. "I try hard to not to do things that will make other people avoid or reject me") using a 5-point scale (1 = *not at all*, 5 = *extremely*). Desire for acceptance and belonging was calculated by averaging responses, with higher scores indicating greater need to belong ($M = 3.11$, $SD = 0.62$, $\alpha = 0.80$).

State desire to foster social connection. Participants completed the 10-item State Motivation to Foster Social Connection Scale (Bernstein et al., 2019) to measure the extent that participants were, in the moment, motivated toward social connection (e.g. "Right now, being close with my friends, family, and significant others is important to me"), using a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*). State motivation to foster social connections was

calculated by averaging responses, with higher scores indicating greater motivation ($M = 4.49$, $SD = 1.14$, $\alpha = 0.91$).

General motivation for intimacy. Participants completed the 10-item version of the intimacy subscale from the Unified Motive Scales (Schönbrodt & Gerstenberg, 2012) to measure general motivation towards intimacy and closeness. The first 3 items (e.g. “Have a close, intimate relationship with someone”) used a 5-point scale (0 = *not important to me*, 5 = *extremely important to me*). The remaining 7 items (e.g. “I like to fully immerse myself in a relationship”) used a 5-point scale (0 = *strongly disagree*, 5 = *strongly agree*). General intimacy motive was calculated by averaging responses, with higher scores indicating greater intimacy motive ($M = 2.87$, $SD = 0.75$, $\alpha = 0.80$).

Perceived relationship quality: Intimacy and Trust. Participants completed the 6 items of the combined trust and closeness subscales of the Perceived Relationship Quality Component (Fletcher, Simpson, & Thomas, 2000) to measure explicit trust and intimacy and closeness in their relationship with their chosen close other (e.g. “How intimate is your relationship?”, “How much can you count on this person?”) using a 7-point scale (1 = *not at all*, 7 = *extremely*). Trust and intimacy and closeness were both calculated separately by averaging responses, with higher scores indicating greater perceived trust and intimacy and closeness ($M_{\text{Trust}} = 5.96$, $SD_{\text{Trust}} = 1.11$, $\alpha_{\text{Trust}} = 0.81$, $M_{\text{Intimacy}} = 5.56$, $SD_{\text{Intimacy}} = 1.17$, $\alpha_{\text{Intimacy}} = 0.81$).

Implicit close other attitudes. Participants completed the Name Letter Task (NLT; Nuttin, 1985), to measure implicit close other evaluations. Following the procedure of LeBel & Gawronski, (2009) participants rated how much they liked each letter of the alphabet using a 7-point scale (1 = *I don't like it at all*, 7 = *I like it very much*). Participants were presented a fixed random order of the alphabet and instructed to make their ratings as quickly as possible using their “gut feelings” to each letter. Implicit partner attitudes were calculated using the scoring algorithm used by LeBel & Campbell (2009) which has been validated against other NLT scoring algorithms used in other close relationship studies (LeBel & Gawronski, 2009). The algorithm controls for participant’s individual differences in their letter ratings by centering participant’s ratings relative to their individual mean score. This helps control for individual variations, such as participants scoring all letters high or low on the scale ($M = 0.38$, $SD = 1.05$, $\alpha = 0.17$).

LEGO Task. The LEGO task was a novel implicit closeness task designed by the present investigators. Participants were told to create a neutral scene using LEGO blocks and figures including themselves and their close other on a 32 x 32 study LEGO baseplate. The scene was of themselves and their close other on a Saturday afternoon at the city park. They also labeled the LEGO figures to distinguish which figure represented themselves and which figure represented their close other. Participants were given the materials and instructions to create the scene while the investigator left the room. The task was coded in four major dimensions for both the “actor” (the participant) and “partner” (the participant’s chosen close other) minifigures: **X/Y coordinates (LEGO distance)**, the **direction of the body**, the **direction of the face** (eye-contact), and **whether those directions of the minifigures are towards each other**. The X and Y coordinates were counted using the LEGO studs on the plate like points on a grid of graph paper (see Figure 1). The left, bottommost stud of the rectangular LEGO plate was treated as the origin point (0,0) and all studs to the right of the origin point counted as positive X coordinates and all studs above the origin point counted as positive Y coordinates. Because minifigures have two feet that may both serve as location points of the minifigure, the minifigure’s right foot was used as the exact X/Y coordinates for consistency. The distance between the partner and actor minifigures was calculated by $D = (x_1 - x_2)^2 + (y_1 - y_2)^2$ as used by Gehring & Wyler (1986; $M_{\text{Distance}} = 23.88$, $SD_{\text{Distance}} = 40.38$). The directions of the body and face of the minifigures were coded as representing one of the 16 cardinal directions, using the origin point of the LEGO base plate as the center of a compass. Additionally, whether the partners were facing each other or not was coded as a binary Yes/No. “Facing each other” was considered when the opposing minifigure were within a 180 degree of the facial direction of the minifigure in question. This additional Yes/No “facing each other” variable was to ensure that the context of facial directions is properly included. For example, if one minifigure is facing “East” and the other facing “West”, it would be unclear from that information alone whether they were facing each other or not (e.g. if they were back-to-back versus looking at each other). Because of time constraints on the project, this pilot study will only present the distance data.

Demographic Covariates

Gender. Prior research suggests that women tend to score higher on motivation for implicit intimacy than men (Drescher, Amely, & Schultheiss, 2016) and tend to have higher motivation to socially connect than men (Dufner, Arslan, Hagemeyer, Schönbrodt, Denissen,

2015; Hagemeyer & Neyer, 2012). Controlling for gender should help clarify the variance of the main analyses.

Length of relationship. The length of a relationship has been linked to greater intimacy and closeness between friends (Hays, 1985). Considering also that people become better matching, more cohesive, in their relationships over time (Anderson, Keltner, & John, 2003), the length in which participants have known their close other may naturally constitute certain levels of intimacy and closeness. However, other research suggests that intimacy and closeness become less salient in longer-term (e.g. decades) friendships (Ledbetter, Griffin, & Sparks, 2007).

Type of relationship. Moreover, it may be that different kinds of relationships beget different aspects related to intimacy and closeness in the relationship or manifest differently in the LEGO implicit test. People communicate and interact differently in different kinds of relationships (Bevan, 2010; Canary, Stafford, Hause, & Wallace, 1993). We focused on the following close relationships: Friend, Partner/Spouse/Significant Other, Immediate Family Member, Extended Family Member, Co-worker/Colleague, Neighbor.

Procedure

Participants arrived at the lab and completed several questionnaires on a computer, including demographic questions, and an implicit attitudes measure. At the start of the questionnaires, participants were asked to think of someone in their life they are close to and to keep that same person in mind for the remainder of the study. Participants reported the first and last initials of this person, the type of relationship they had with this person (e.g. Friend, Partner, Immediate Family Member), and how long they have known them. After completing the questionnaires, participants completed the LEGO task.

Results

Preliminary Analyses

One LEGO distance score was removed from the data because it was nearly 8 standard deviations above the mean. The remainder of that participant's data was determined to be within adequate constraints to remain in the analyses. Another participant who did not follow study instructions was removed from all analyses. During the study, nearly half of participants placed themselves or their partners as standing up (and thereby having a precise X/Y stud location).

Consequently, nearly half of the LEGO figures were not fixed onto the studs of LEGO baseplate (e.g. figures sitting down on a bench). An additional variable was added to the LEGO coding to track whether the actor or the partner was standing or not. To assess differences between figure distance measures depending on if they were sitting or not, a t-test was used for both actors and partners. There was no significant difference between actor distances, $t(73) = 1.42, p = 0.161$, or partner distances $t(74) = 0.48, p = 0.632$, based on whether the figures were sitting or standing. Subsequent analyses, therefore, did not include whether the figures were standing or not as a covariate.

Initial correlations of the tested variables can be found in Table 1. There are several correlations of note. Negative correlations between explicit intimacy and closeness and LEGO distance suggest that smaller distances between LEGO figures was related to higher explicit intimacy and closeness. Moreover, both were correlated with explicit trust. Neither were significantly correlated with the other motivational antecedents of intimacy and closeness (i.e., state desire to foster social connection, general intimacy motive, or need to belong). The three motivational antecedents of intimacy and closeness were all significantly correlated with one another in a theoretically consistent manner. However, unlike previous literature, gender did not significantly correlate with other forms of intimacy and closeness motives.

Predicting Explicit Intimacy and Closeness from the LEGO task

To evaluate whether the distance component of the LEGO task predicted explicit intimacy and closeness, a series of multiple regression models were performed. Covariates were iteratively added to examine the individual variance explained by subsequent variables (see Table 2). LEGO distance significantly predicted explicit intimacy and closeness across all four models, even when accounting for variance explained by demographic, implicit, and motivation covariates (see Table 2, Model 4). Gender and relationship length had negligibly small effect sizes and did not significantly predict explicit intimacy and closeness (see Table 2, Model 2). None of the implicit and motivation covariates significantly predicted explicit intimacy and closeness, however, need to belong was nearly significant (see Table 2, Model 3). Their small (but nonsignificant) effect sizes remained, even as the effect of LEGO distance on explicit intimacy and closeness emerged consistently significant above and beyond the effects of all of the covariates (see Table 2, Model 4). This fourth model explained a significant proportion of the

variance in explicit intimacy and closeness, $R^2 = 0.397$, $F(7, 74) = 6.30$, $p < .001$. This was taken as a first indicator that the LEGO distance measure indeed predicts intimacy and closeness at some level.

Predicting Explicit Trust from Implicit and Explicit Intimacy and Closeness

A series of models were run to assess how LEGO distance predicted a relationship outcome, in this case explicit trust, controlling for variance explained by explicit intimacy and closeness. LEGO distance significantly predicted explicit trust (see Table 3, Model 1). Its effects remained even when accounting for the variance explained by the demographic covariates, where relationship length also significantly predicted explicit trust (see Table 3, Model 2). Meanwhile, the effect of gender was nonsignificant. However, the effect of LEGO distance on explicit trust disappeared when accounting for explicit intimacy and closeness (see Table 3, Model 3). Moreover, while explicit intimacy and closeness eliminated the predictive effect of LEGO distance on explicit trust, the effect of relationship length remained (see Table 3, Model 4). Explicit intimacy and closeness uniquely explained the variance of LEGO distance (but not the variance of another significant predictor like relationship length) in explicit trust. The fourth model explained a significant amount of the variance in explicit trust, $R^2 = .318$, $F(4, 70) = 8.17$, $p < .001$.

Antecedents of Implicit and Explicit Closeness

Considering their moderate correlation (see Table 1) and the consistent effect of LEGO distance in predicting explicit intimacy and closeness, and the predictive effects of explicit intimacy and closeness (but not LEGO distance) on explicit trust, it was considered whether the distance measure may simply be a lesser, or encompassed, measure of explicit intimacy and closeness. To investigate differences, if any, between the LEGO distance component and explicit intimacy and closeness, three models were created to explore what contributes to each intimacy and closeness measure (see Table 4). The implicit and motivation variables had nonsignificant effects on LEGO distance. However, state desire to foster social connection and general intimacy motivation were significant in predicting explicit intimacy and closeness (Table 4, Model 1). Implicit partner attitudes were very near significant in predicting explicit intimacy and closeness. The effects of relationship length and gender were not significant in predicting LEGO distance or explicit intimacy and closeness (Table 4, Model 2). Altogether, none of the predictors had

significant effects on LEGO distance. However, the significant (albeit small) effects of state desire to foster social connection, general intimacy motive, and implicit partner attitudes on explicit intimacy and closeness remained nearly unchanged (see Table 4, Model 3).

Is the LEGO Task Just Another Explicit Measure?

Were the LEGO task an explicit measure, it should also fit relatively well into the scale reliability of an explicit measure of the same construct. To test this possibility, a McDonald's ω reliability test was used with the three explicit intimacy and closeness items and LEGO distance ($\omega = .623$, $\alpha = .187$). McDonald's ω (1999) is a congeneric reliability test that allows for item variances to vary and better accounts for incongruent response formats (Dunn, Baguley, Brunsdon, 2013; Graham, 2006). ω reliability improved substantially to 0.83 by removing LEGO distance from the scale, suggesting that LEGO distance is not encompassed by the explicit intimacy and closeness items (see Table 5).

Discussion

This pilot study of the LEGO task explores whether the distance measure could predict intimacy and closeness and how the measure relates to other antecedents of intimacy and closeness (i.e. motivation and implicit attitudes). The distance measure predicted explicit intimacy and closeness however, unlike the explicit measure, it was not predicted by intimacy motivations and implicit attitudes. LEGO distance was a significant predictor of a relationship outcome (trust) until explicit intimacy and closeness was introduced to the model. However, LEGO distance did not fit with the other explicit intimacy and closeness items in reliability tests.

The distance measure of the LEGO task predicts intimacy and closeness, however, it does not appear to be the *same* as explicit intimacy and closeness. As two measures of the same construct, one would expect them to have some similarities. The presented analyses reflect that theoretical expectation. Regressions suggest LEGO distance predicts above and beyond other motivations that also predict intimacy and closeness. Overall, LEGO distance and explicit intimacy and closeness have parallel correlations with the other variables too (see Table 1). In this sense, the LEGO distance measure seems to consistently pair with the corresponding explicit measure of intimacy and closeness. However, they differ in a few key areas that make it difficult to claim they are simply two measurements of the same type on the same construct. The motivational and implicit measures that predict explicit intimacy and closeness do not predict

LEGO distance. In other words, LEGO distance and explicit intimacy and closeness seem to have different antecedents which further suggests they are not simply the same measure. Moreover, the reliability analysis (see Table 5) shows that LEGO distance coalesces poorly with the explicit intimacy and closeness items. This sharp divergence in reliability metrics, and their differing antecedents, suggest that LEGO distance is not simply a copied, or lesser, version of the same explicit intimacy and closeness measure. In other words, LEGO distance appears like a measure of explicit intimacy and closeness but is not simply a copy of an explicit measure.

While it seems that the distance measure is *not* explicit intimacy and closeness, it is still unclear what it *is*. The natural next consideration is whether it is an indirect measure of intimacy and closeness or an implicit one (or both). However, this question remains unanswerable by the data gathered in this pilot. This study did not assess whether participants discerned the deeper meaning of the task by asking them what they thought the it was measuring. Therefore, without asking participants themselves, it remains uncertain whether the task was direct or indirect. As for whether the distance measure is implicit or explicit, the NLT used in this study sheds little light on that question. The implicit close other attitudes measured by the NLT were not a significant predictor of either intimacy and closeness measure and had small effect sizes. More problematic, however, was the very low reliability of the NLT ($\alpha = .17$). Such poor reliability fits with past literature that has suggested the NLT is a poor measure of implicit constructs (in part because of its poor reliability; Buhrmester, Blanton, & Swann, 2011). While used in this study for its expediency, more robust implicit measures are necessary to make deeper claims about how implicit or not the LEGO distance measure is.

While certainly a novel finding that LEGO distance is reflecting intimacy and closeness at all (much less as distinct from explicit intimacy and closeness) it is not entirely without precedent. Previous work has used physical proximity as a reflection of intrapersonal processes in terms of families (Gehring & Wyler, 1986), attachment theory (Fay & Maner, 2012; Dewitte & De Houwer, 2008), and interacting with strangers (Won, Shriram, & Tamir, 2017). Older tests have used less physically tangible representations of people to assess similar constructs like studying psychological closeness using photographs (Argyle & Dean, 1965), or silhouettes (Little, 1965) and more modern ones have used virtual manikins (DeWitte, De Houwer, & Koster, 2010). In this sense, it is perhaps not too surprising that the distance measure between LEGO figures encompasses a potentially unique aspect of intimacy and closeness.

Future Work and Limitations

As an exploratory pilot study on a novel measure, there are substantial new avenues of research to address unanswered questions from this data. To start, future work should use more robust implicit measures to better compare this LEGO distance measure. A deeper, more reliable point of comparison should help untangle questions of how implicit the distance measure, or the LEGO task generally, really is. Additionally, assessing more relationship outcomes other than trust should help tease out differences between the LEGO distance and explicit measures. For example, will both measures predict something like relationship satisfaction or responsiveness in a similar way that they predicted trust? As alluded to earlier, future work should ask participants of their impression of the task to more clearly assess how direct the task is. For example, if most participants intuitively understand the goal of the task, we can more confidently claim it is a direct measure. Also, were participants simply primed for closeness by the questionnaires before the LEGO task? And would these closeness results hold if using a different relationship? This study prompted participants to think of a particularly close, salient relationship to highlight intimacy and closeness effects. However, it remains to be seen how the LEGO task would function with less intimate and close relationships.

Additional data from the other components of the LEGO task may shed more light on this question as well. Body and facial orientation data was not analyzed in this study due to time restrictions so it remains to be seen to what extent they reflect any level of intimacy and closeness. And if so, how does such data fit with LEGO distance and explicit intimacy and closeness? What about the type of the relationship? Does it matter whether the relationship in question is a friend, or a significant other, or a family member? Perhaps some relationships differ such that different measures in the LEGO task capture different aspects of intimacy and closeness for each type of relationship. Because the LEGO task is flexible to account for different relationship types, rather than specifically default to romantic relationships as many other intimacy and closeness measures (Fletcher et al., 2000; Hagemeyer & Neyer, 2012; McNulty et al., 2014), future work should explore this level of relationship data. While not explored in this study, the LEGO task may also be used in deeper dyadic analysis. Considering the task asks participants to create representations of their relationship (including themselves and their close other) from their point of view, future work should have both members of the relationship participate to analyze actor and partner effects (e.g. APIM; Kash & Kenny, 2000).

Much of the future work that can build upon this pilot, and prod its limitations, relies on larger and more diverse sample sizes as well. Greater statistical power should help instill more confidence in the small effects found in many of the motivation covariates, for example. More specifically, a larger population size could allow for more robust statistical tests like structural equation modeling that better account for internal consistency (as recommended for validating implicit measures; Kurdi et al., 2018). On a slightly different note, a more diverse population, or testing in different populations, may also help address noise introduced by norms of physical closeness. Norms of interpersonal distance between people, including body orientation, differ between cultures (Remland, Jones, & Brinkman, 1995) which may influence participants' use of the LEGO task (e.g. distance and body orientation). For example, Mediterranean and more collectivist societies tend to interact more physically closely than North American, Northern European, or more individualistic societies (Holland, Roeder, van Baaren, Brandt, & Hannover, 2004; Sorokowska, et al., 2017). Other research suggests that people tend to feel closer to each other the closer in proximity they are to each other (Won et al., 2017). In other words, Greek participants, for example, may on average put their LEGO figures closer than English participants. It remains to be seen if such placement more reflects cultural proximity differences or differences in intimacy and closeness or both (e.g. Greeks may, on average, be more intimate and close with their close others). Previous work has also suggested people with different attachment styles (e.g. avoidant attachment) have different expectations and motivations for proximity with others (Dewitte & De Houwer, 2008). While this study accounted for general motivation for intimacy, attachment styles present a potentially more salient integration of individual differences in examining performance on the LEGO task. In other words, future work should further explore how to account for differences between groups, and individuals, in the LEGO task.

In conclusion, there are multiple, varied, and exciting futures, that can build upon this work. At the very least, this pilot study was successful in showing that this novel LEGO task does reflect intimacy and closeness and has the key pieces to contribute to psychological understanding of intimacy and closeness in more accessible and potentially meaningful ways. Future work is critical to assessing the viability and validity of the LEGO task, both to investigate avenues presented by the authors and those that have not been considered. As the field continues to uncover more robust ways to approach and understand implicit measures, and

the constructs they seek to understand (Forscher et al., 2019), it is indeed an exciting time to pursue new implicit measures of intimacy and closeness.

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Table 1

Correlations between intimacy and closeness measures and demographic variables (N = 77)

Variables	1	2	3	4	5	6	7	8	9
1. LEGO Distance	-								
2. Explicit Intimacy and Closeness	-0.56***	-							
3. Explicit Trust	-.34**	.55***	-						
4. Need to Belong	.15	-.20	-.26*	-					
5. State Desire to Foster Social Connection	.16	-.21	-.28*	.51***	-				
6. General Intimacy Motive	.004	.08	-.03	.25*	.56***	-			
7. Implicit Close Other Attitudes	-.18	.20	.17	.09	.04	.005	-		
8. Relationship Length	.03	.08	.31**	-.21	-.21	-.29*	-.10	-	
9. Gender	-.002	-.03	-.14	.13	.07	-.19	.15	.01	-

^aGender: 1 = *male*, 0 = *female*. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2

Summary of regression models predicting explicit intimacy and closeness

Model and Variables	<i>b</i>	<i>SE</i>	CI _{95%}	<i>t</i>	<i>p</i>
<i>Model 1 (No Covariates)</i>					
LEGO Distance	-1.28	.23	[-1.73, -.83]	-5.70	<.001
<i>Model 2 (Demographic Covariates)</i>					
LEGO Distance	-1.28	.23	[-1.74, -.83]	-5.66	<.001
Gender	-.02	.114	[-.25, .21]	-.16	.877
Relationship Length (Months)	.06	.09	[-.11, .24]	.72	.475
<i>Model 3 (Implicit and Motivation Covariates)</i>					
LEGO Distance	-1.12	.23	[-1.57, -.67]	-4.97	<.001
Need to Belong	-.20	.10	[-.40, .00]	-1.98	.052
State Desire to Foster Social Connection	-.10	.12	[-.34, .13]	-.86	.393
General Intimacy Motivation	.18	.10	[-.02, .39]	1.76	.082
Implicit Close Other Attitudes	.09	.09	[-.08, .27]	1.07	.289
<i>Model 4 (All Covariates)</i>					
LEGO Distance	-1.12	.23	[-1.58, -.67]	-4.93	<.001
Gender	.06	.12	[-.17, .29]	.52	.60
Relationship Length (Months)	.07	.09	[-.11, .25]	.76	.45
Need to Belong	-.19	.10	[-.40, .01]	-1.87	.07
State Desire to Foster Social Connection	-.11	.12	[-.35, .13]	-.94	.35
General Intimacy Motivation	.22	.11	[-.01, .44]	1.95	.06
Implicit Close Other Attitudes	.09	.09	[-.08, .27]	1.05	.30

Note. N = 75 complete cases. Higher scores on continuous variables reflect larger standing (e.g. higher need to belong). Gender is coded such that 1 = *male*, 0 = *female*. All continuous variables were z-score standardized before analyses.

Table 3

Summary of regression models predicting explicit trust from intimacy and closeness measures

Model and Variables	<i>b</i>	<i>SE</i>	CI _{95%}	<i>t</i>	<i>p</i>
<i>Model 1 (No Covariates)</i>					
LEGO Distance	-.80	.26	[-1.31, -.28]	-3.09	.003
<i>Model 2 (Demographic Covariates)</i>					
LEGO Distance	-.82	.24	[-1.30, -.33]	-3.36	.001
Gender	-.17	.12	[-.41, .07]	-1.39	.169
Relationship Length	.29	.10	[.10, .48]	3.02	.004
<i>Model 3 (Explicit Intimacy Covariate)</i>					
LEGO Distance	-.30	.29	[-.88, .29]	-1.01	.315
Explicit Intimacy and Closeness	.39	.13	[.14, .64]	3.06	.003
<i>Model 4 (All Covariates)</i>					
LEGO Distance	-.36	.28	[-.91, .20]	-1.29	.202
Gender	-.16	.12	[-.40, .07]	-1.41	.163
Relationship Length	.27	.09	[.08, .45]	2.92	.005
Explicit Intimacy and Closeness	.36	.12	[.12, .60]	2.95	.004

Note. N = 75 complete cases. Higher scores on continuous variables reflect larger standing (e.g. higher need to belong). Gender is coded such that 1 = *male*, 0 = *female*. All continuous variables were z-score standardized before analyses.

Table 4

Summary of regression models predicting intimacy and closeness from motivation and implicit antecedents

Model and Variables	LEGO Distance					Explicit Intimacy and Closeness				
	<i>b</i>	<i>SE</i>	CI _{95%}	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	CI _{95%}	<i>t</i>	<i>p</i>
<i>Model 1 (Implicit and Motivation Variables)</i>										
Need to Belong	.03	.05	[-.07, .14]	.65	.521	-.14	.13	[-.39, .11]	-1.12	.266
State Desire to Foster Social Connection	.08	.06	[-.05, .20]	1.26	.211	-.30	.15	[-.59, .00]	-2.00	.049
General Intimacy Motivation	-.05	.05	[-.16, .06]	-.93	.356	.28	.13	[.02, .54]	2.11	.039
Implicit Close Other Attitudes	-.08	.05	[-.17, .01]	-1.69	.095	.22	.11	[.00, .43]	1.99	.051
<i>Model 2 (Demographic Variables)</i>										
Gender	-.001	.06	[-.12, .12]	-.02	.987	-.04	.15	[-.34, .26]	-.27	.787
Relationship Length	.01	.05	[-.08, .10]	.24	.810	.08	.12	[-.15, .32]	.71	.479
<i>Model 3 (All Covariates)</i>										
Need to Belong	.04	.06	[-.07, .15]	.70	.494	-.13	.13	[-.39, .13]	-1.01	.315
State Desire to Foster Social Connection	.08	.06	[-.05, .21]	1.25	.214	-.30	.15	[-.60, -.003]	-2.02	.048
General Intimacy Motivation	-.05	.06	[-.17, .07]	-.85	.398	.32	.14	[.04, .60]	2.24	.028
Implicit Close Other Attitudes	-.07	.05	[-.17, .02]	-1.59	.117	.22	.11	[-.001, .44]	1.98	.051
Gender	-.01	.06	[-.14, .11]	-.21	.837	.05	.15	[-.25, .34]	.30	.764
Relationship Length	.01	.05	[-.08, .11]	.27	.788	.11	.12	[-.13, .34]	.91	.367

Note. N = 75 complete cases. Higher scores on continuous variables reflect larger standing (e.g. higher need to belong). Gender is coded such that 1 = *male*, 0 = *female*. All continuous variables were z-score standardized before analyses.

Table 5

Reliability Statistics of Intimacy and Closeness Measures

Items	McDonald's ω	Cronbach's α
Full Scale (Items 1-4)	.623	.187
<i>If Item Dropped</i>		
1. How intimate is your relationship?	.513	-.429
2. How close is your relationship?	.325	-.602
3. How connected are you to this person?	.314	-.503
4. LEGO Distance	.825	.817

Note. Items 1-3 are the three explicit intimacy and closeness items.

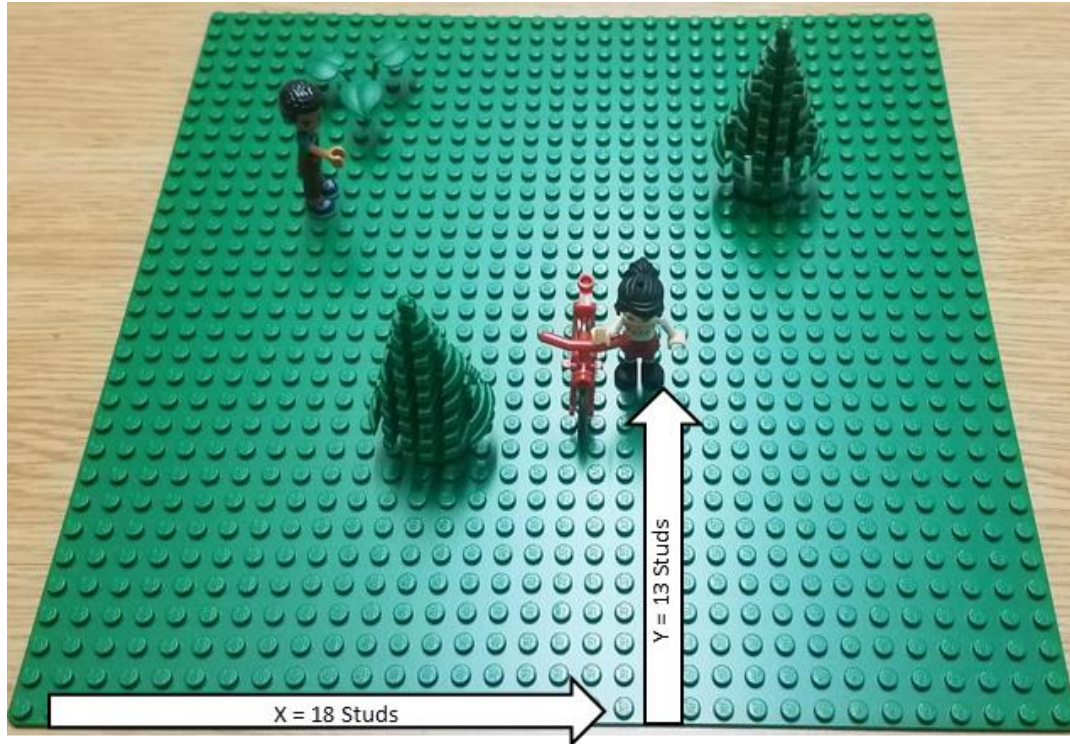
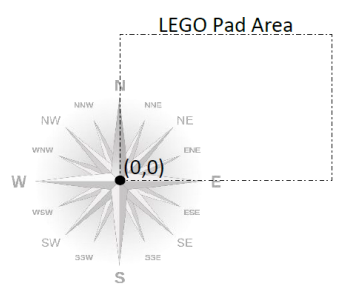


Figure 1. Example scene in the LEGO task. Coding for this example scene can be found in Appendix A.

Appendix A

PIN # _____

Coding Sheet



	X Coordinates (In LEGO Studs from origin)	Y Coordinates (In LEGO Studs from origin)	Body Cardinal Direction	Facial Cardinal Direction	Facing Partner? (Yes/No)	Figures Standing? (Yes/No)
Actor (Blue)	18	13	S	S	No	Yes
"Partner" (Orange)	6	20	E	SE	Yes	Yes