

**Development of the Reporting Information about Networks and Groups (RING) Task: A method for eliciting information from memory about associates, groups, and networks**

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## MANUSCRIPT DETAILS

TITLE: Development of the Reporting Information about Networks and Groups (RING) Task: A method for eliciting information from memory about associates, groups, and networks

## ABSTRACT:

Eliciting detailed and comprehensive information about the structure, organisation, and relationships between individuals involved in organised crime gangs, terrorist cells and networks is a challenge in investigations and debriefings. Drawing on memory theory, the aim of the current project was to develop and test the Reporting Information about Networks and Groups (RING) task, using an innovative piece of information elicitation software.

Using an experimental methodology analogous to an intelligence gathering context, participants (N = 124) were asked to generate a visual representation of the "network" of individuals attending a recent family event using the RING task.

All participants successfully generated visual representations of the relationships between people attending a remembered social event. The groups or networks represented in the RING task output diagrams also reflected effective use of the software functionality with respect to "describing" the nature of the relationships between individuals.

CUST\_RESEARCH\_LIMITATIONS/IMPLICATIONS\_\_(LIMIT\_100\_WORDS) :No data available.

We succeeded in establishing the usability of the RING task software for reporting detailed information about groups of individuals and the relationships between those individuals in a visual format. A number of important limitations and issues for future research to consider are examined.

CUST\_SOCIAL\_IMPLICATIONS\_\_(LIMIT\_100\_WORDS) :No data available.

The RING task is an innovative development to support the elicitation of targeted information about networks of people and the relationships between them. Given the importance of understanding human networks in order to disrupt criminal activity, the RING task may contribute to intelligence gathering and the investigation of organised crime gangs and terrorist cells and networks.

Running head: Eliciting information about criminal gangs and terrorist cells

Development of the Reporting Information about Networks and Groups (RING)

Task: A method for eliciting information from memory about associates, groups, and networks

## Abstract

**Purpose:** Eliciting detailed and comprehensive information about the structure, organisation, and relationships between individuals involved in organised crime gangs, terrorist cells and networks is a challenge in investigations and debriefings. Drawing on memory theory, the aim of the current project was to develop and test the Reporting Information about Networks and Groups (RING) task, using an innovative piece of information elicitation software.

**Methodology:** Using an experimental methodology analogous to an intelligence gathering context, participants (N = 124) were asked to generate a visual representation of the 'network' of individuals attending a recent family event using the RING task.

**Findings:** All participants successfully generated visual representations of the relationships between people attending a remembered social event. The groups or networks represented in the RING task output diagrams also reflected effective use of the software functionality with respect to 'describing' the nature of the relationships between individuals.

**Research Limitations/Implications:** We succeeded in establishing the usability of the RING task software for reporting detailed information about groups of individuals and the relationships between those individuals in a visual format. A number of important limitations and issues for future research to consider are examined.

**Originality:** The RING task is an innovative development to support the elicitation of targeted information about networks of people and the relationships between them. Given the importance of understanding human networks in order to disrupt criminal activity, the RING task may contribute to intelligence gathering and the investigation of organised crime gangs and terrorist cells and networks.

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3 Development of the Reporting Information about Networks and Groups (RING) Task:  
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5 A method for eliciting information from memory about associates, groups, and  
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7 networks  
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12 Familial, friendship and formal relationships between individuals in networks, and  
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14 connections between and across such networks are “crucial determinants of  
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16 performance, sustainability and success of both criminal and terrorist organisations”  
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18 (Ozgul, 2016, p.41). Information about terrorist or other criminal networks might be  
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20 obtained from numerous sources, including live observations, historical patterns,  
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22 digital communications, telephone records etc. To date, however, one important  
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24 source of such information has received little attention. Human informants (who  
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26 might be witnesses, suspects, or other sources) often have detailed and rich  
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28 understandings of social groups they observe or are part of. In the absence of  
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30 dedicated tools or techniques for eliciting information of this nature, obtaining  
31  
32 detailed and comprehensive insights from cooperative sources about the individuals  
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34 involved in organized crime gangs and terrorist cells and networks often presents a  
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36 challenge. Thus, our aim was to develop a tool designed to facilitate the reporting of  
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38 information about networks of individuals and then test whether individuals could use  
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40 the tool to represent remembered groups of people and the nature of relationships  
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42 between them.  
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49 Organised crime has been characterized as comprising the inter-relationships  
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51 between criminal networks, legitimate network and personal networks (Smith &  
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53 Papachristos, 2016). In this context, complex and multi-layered networks have been  
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55 described as a multiplexity where individuals are linked in more than one way or in  
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57 more than one relationship (Wasser & Faust, 1994; see also Smith & Papachristos,  
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3 2016). In a similar vein, terrorist networks have been identified as criminal networks  
4 sharing particular ideologies, a propensity to use violent means to achieve their goals,  
5 sources of finance and secrecy (Ozgul & Bowerman, 2014). Given complex network  
6 structures in both organised crime and terrorist operations, a key counter-terrorism  
7 priority is to understand and analyse the structure of networks. Klerks (2001) argued  
8 that three key factors are important in such analyses. First, a structural analysis is  
9 necessary to understand the characteristics of the network structure and topology –  
10 what kind of network is it and how is it organised? Is it hierarchical, cell-based or  
11 more informally structured? Second, a positional analysis of network members is  
12 required to determine the relative positions (and, hence, power, importance,  
13 dominance, leverage potential) of individuals in the networks. Finally, a relationship  
14 analysis permits a deeper understanding of the network and individuals in it (e.g. who  
15 is a friend, who has family obligations or other duties).

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33 Information about criminal networks to inform such analysis is typically  
34 drawn from a variety of sources including judicial documents, investigation files, case  
35 notes and intelligence databases. More recently, mobile phone and digital or online  
36 activity has prompted research on communication links and channels (e.g. Tahal &  
37 Yoo, 2019). Formal methods, such as social network analysis, is often used to  
38 structure intelligence on criminal or terrorist networks and to analyse complex  
39 relationships (Calderoni, 2014; Sparrow, 1991; see also Kriegler, 2014).

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49 One source of information about the structure of criminal networks is human  
50 intelligence (HUMINT) obtained from sources, informants, or cooperative suspects.  
51 Although different techniques have been developed to conduct interviews in forensic  
52 and, increasingly, in intelligence gathering contexts, little attention has been paid to  
53 systematically eliciting information about the structure of target groups, gangs, cells  
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3 or networks i.e. who is involved, what is their role and what are the links between  
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5 individuals. This is a rather surprising omission given the importance of  
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7 understanding the structure of networks, and the relationships between individuals  
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9 involved in them, in order to understand and disrupt the criminal activities of such  
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11 networks.  
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15         Generating a list of people known to be involved in a gang or network is  
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17 fundamentally a memory task. As such, it is vulnerable to the well-documented  
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19 shortcomings of human memory (Schacter, 2001). When people are asked to generate  
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21 lists from memory, errors frequently occur. Specifically, people leave out information  
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23 (errors of omission) and/or include erroneous information (errors of commission).  
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25 Both types of error are problematic in the HUMINT context. Failure to identify  
26  
27 relevant players in a network may be disastrous if a target is not detected and goes on  
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29 to commit an atrocity. Similarly, allocating expensive and scarce resources to  
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31 investigate individuals who are not involved is wasteful, and may distract from  
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33 relevant targets.  
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38         To this end, the current research draws on a relatively simple idea for a novel  
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40 information elicitation technique – the notion that visually representing the links  
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42 between people should (i) facilitate recall of individuals who associate with that  
43  
44 particular group or network, and (ii) prompt recollection of additional individuals.  
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46 There are a number of sound theoretical reasons to make such predictions. At least  
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48 one prominent memory theory represents memory as a semantically organised  
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50 network of nodes made up of related concepts and items of information that can,  
51  
52 through spreading activation, cue each other (Anderson, 1983). In the case of  
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54 networks of people then, it may be that individuals in the network can act as cues for  
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56 other individuals and prompt more elaborative retrieval of each individual. As such,  
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3 using a visual format that facilitates the description of a network, should also  
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5 capitalize on the semantic organization of memory and enable interviewees to  
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7 effectively prompt their own recall with cues that are both salient, and strongly  
8  
9 associated with the target memory. Accordingly, a close match between the way in  
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11 which memory is organised and the reporting format should benefit recall (for a  
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13 similar argument, see Hope et al., 2019).  
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17 'Family trees' are familiar and common visual formats in which to represent  
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19 relationships. Indeed, the visualisation of family structures and relationship networks  
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21 using 'genograms' (pictorial representations of family structure over different  
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23 generations) has been a staple of systemic therapy approaches used in clinical and  
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25 therapeutic contexts to understand relevant information about complex or extended  
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27 familial or other relationships (McGoldrick, Gerson & Petry, 2008). There is also  
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29 some evidence for 'family trees' as a useful mnemonic for eliciting information about  
30  
31 events and people. Leins, Fisher, Pluwinski, Rivard and Robertson (2014) found that  
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33 interviews using a set of mnemonics that included a 'family tree' task elicited  
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35 significantly more information (cf. interviews using no mnemonics), although it was  
36  
37 not possible to isolate the independent contribution of the family tree task.  
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42 Leins et al. (2014) also identified an experimental methodology analogous to a  
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44 relevant HUMINT context. In the field, interviewers might be tasked with debriefing  
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46 a source or informant who has information about the membership and activities of a  
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48 terrorist group. Family meetings might be considered an analogue for meetings  
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50 between members of a terrorist group or criminal gang as they share several features  
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52 relevant for cognition and memory. Both may occur a number of times, on a semi-  
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54 regular basis, at any number of geographical locations and specific venues. Such  
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56 meetings may involve various different attendees who are part of the same network  
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3 (family or terrorist group). Following Leins et al. (2014), we adopted the ‘family  
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5 event’ analogue.  
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### 7 8 **Aims of the Current Study** 9

10 The first aim was to develop a novel information elicitation task, the  
11  
12 Reporting Information about Networks and Groups (RING) task, using software that  
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14 enabled individuals to provide a meaningful report on the membership of, and  
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16 relationships within, networks in a visual format.  
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19 The second objective was to establish whether members of the public, with no  
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21 specialist skills, could use the RING task software effectively and with minimal  
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23 training, to illustrate, in an easy-to-interpret visual format, networks or groups of  
24  
25 individuals involved in a personally experienced event. This rationale for this  
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27 methodology is to draw an analogy to sources or other informants using the software  
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29 to report on the structure of gangs or networks, relying on their knowledge of the  
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31 group and memory for people involved in it. While a paper-based version of this task  
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33 might be used to elicit a visual representation of a network in certain debriefing or  
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35 interviewing contexts, there are also contexts in which it may be either impossible or  
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37 unsafe to use a paper-based version of the task. In such contexts an electronic version  
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39 (where the output can be removed immediately from the scene) may be a useful and  
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41 viable alternative. An electronic version is also more suitable for remote reporting and  
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43 also facilitates a recorded version of the task (and how it was completed).  
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45 Additionally, an electronic version also offers greater functionality (i.e. more options  
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47 for representing relationships in a systematic way) and provides a standardised  
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49 reporting format.  
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55 The third aim was to determine whether individuals could effectively use the  
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57 functionality in the RING task to provide qualitative information about the nature of  
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3 the relationships between the individuals mentioned, including perceived importance  
4 of particular individuals within the network, perceived strength of relationship  
5 between individuals and perceived direction of the relationship. For example, a person  
6 with status or importance might be represented by a larger node in the network while  
7 stronger relationships between certain individuals might be represented by a thicker  
8 (cf. thinner) line connecting them. Proximity (i.e. how closely the different nodes  
9 were positioned) might be used to reflect closer or more distant involvement. These  
10 distinctive visual features (i.e. larger nodes, thicker lines, proximity) should facilitate  
11 a clear and more intuitive understanding of the nature of relationships between  
12 individuals well beyond that which might be conveyed in a list or complex verbal  
13 narrative - or even a basic pencil-and-paper version of the task. A final aim of the  
14 study was to elicit usability feedback from participants with respect to the RING task  
15 software interface.  
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## 34 **Method**

### 35 **Participants**

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37 124 members of the public visiting the university on official Open Days (across eight  
38 sessions) were recruited to take part in the study while waiting for other activities to  
39 complete. All participants were informed that taking part was entirely voluntary and  
40 they were under no obligation to take part or complete the task. Participants  
41 comprised prospective students, family members and friends (all took part  
42 individually). Demographics were not recorded due to constraints but the sample  
43 comprised men and women, over the age of 18 years.  
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### 55 **RING Task Development: Technical Description**

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57 We elected to develop a web-based online program using JavaScript which allowed  
58 access to the Reporting Information about Networks and Groups (RING) task from  
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3 smartphones, tablets, PCs and other internet-equipped devices. The program designed  
4 primarily relies on the D3 (Data-Driven Documents; Bostock, 2018) library in tandem  
5 with common web browsing features (HTML, CSS, javascript). These libraries allow  
6 developers to build programs where implicit actions can act to change data structures  
7 in an intuitive manner. For example, clicking within a window signals the creation of  
8 a new node for the network. This node can then be labeled and assigned an identity  
9 (e.g. a name or nickname of someone in the network). D3 also enables instantaneous  
10 visualization of changes in data structure (i.e., the node is visualised after the clicking  
11 on the canvas used for the network visualisation). In other words, as soon as the user  
12 edits the network by adding other people or changing the relationships between  
13 people, these changes can be seen instantly and revised or refined until they best  
14 represent the information being reported. The final version of the RING task software  
15 comprised a number of capabilities, including the functionality to:

- 16 – Create nodes representing particular identifiable individuals in the network (and  
17 label those nodes with the names of those individuals);
  - 18 – Customize the size of a node to illustrate how important or central a node (i.e.  
19 individual) is in the network;
  - 20 – Create links between nodes to illustrate relationships between individuals in the  
21 network;
  - 22 – Customize links between nodes such that thicker lines represent stronger links or  
23 relationships whereas thinner lines represent weaker relationships;
  - 24 – Customize the direction of relationships between individuals with end-point  
25 arrows to illustrate uni-directional or bi-directional (mutual) relationships, or  
26 information flow within the relationship;
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- 4 – Alter the distance or proximity of relationships to reflect more distant clusters by
- 5 making links longer or shorter;
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- 8 – Pull nodes or node clusters apart for convenience of visualization and
- 9 development of network;
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- 12 – Delete nodes or links to correct mistakes.
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15 The RING Task software can be accessed here: <https://forcegraph.netlify.com/>; for a  
16 demonstration video see here: <https://www.youtube.com/watch?v=1jGHCFa0XSM>]

### 19 Measures

21 Each participant generated an individual network diagram (see examples in Figure 1).  
22 After completing the task, participants were asked to rate how clear the instructions  
23 were (1 = Not at all clear; 7 = Very clear), how easy the task was (1 = Not at all easy;  
24 7 = Very easy) and to provide free report feedback on software usability.  
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### 31 Procedure

32 During pilot trials, we collected feedback from participants on the usability of the  
33 software, which resulted in streamlining of the instructions for use of the software for  
34 reporting and improvements to the software user interface. Separate pilot trials (n =  
35 15) were conducted to develop the instructions for the reporting task.  
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41 In the main trial, all participants completed the following procedure  
42 individually. Each participant was asked to remember an event involving multiple  
43 people that happened in the last year such as a family meeting (e.g. Christmas dinner,  
44 wedding), a meeting with friends (e.g. birthday party, field trip), or meeting with  
45 colleagues. They were instructed to provide as much information as possible about the  
46 people who were at, or involved, in that event including as many individuals as they  
47 could recall, the links (i.e. relationships) between those individuals, and the strength,  
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3 direction and proximity of relationships, in the form of a network diagram using the  
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5 RING task software.  
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8 Participants were given brief instructions regarding the software use and  
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10 functions. Each participant took approximately 15 to 20 minutes to complete the  
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12 reporting task and then provided their ratings and feedback.  
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## 15 16 17 **Results**

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19 The main objective was to establish whether individuals could use the RING task  
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21 software to generate an informative visual representation, from memory, of the  
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23 relationships between groups of individuals involved in a personally experienced  
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25 event. Participants reported a variety of different events involving family, friends and  
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27 colleagues. The majority of events reported concerned Christmas gatherings but other  
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29 events included funerals, birthdays, weddings and proms. Participants reported on  
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31 events that occurred, on average, 12.28 weeks before the test session ( $SD = 12.12$ ).  
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33 The mean rating for clarity of instructions was 5.86 ( $SD = 1.12$ ) while the mean rating  
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35 for ease of task was 5.31 ( $SD = 1.19$ ).  
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40 Overall, participants reported an average of 10.08 different individuals as  
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42 attending the reported events ( $SD = 4.02$ ; range = 4-28). The groups or networks  
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44 represented in the RING task output diagrams also reflected effective use of the  
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46 software functionality with respect to 'describing' the nature of the relationships  
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48 between individuals. Family groups tended to be represented by tighter network  
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50 structures (e.g. Figure 1, Panel A) with central individuals indicated by larger nodes  
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52 and stronger links. Events involving friends tended to reflect more diffuse relationship  
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54 groupings, and often included people who, while they might have had a strong  
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56 relationship with at least one person in the network, were not connected with other  
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3 individuals (e.g. see Figure 1, Panel B). For larger events involving more people, we  
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5 also observed the reporting of ‘clusters’. Importantly, the way in which the RING task  
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7 software visually represents the data meant that interpreting how a freestanding  
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9 cluster links to a larger group or network is relatively straightforward. For instance, in  
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11 Figure 1 Panel C, it is clear that only one person in the satellite network has a link to  
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13 the main group.  
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17 Participants indicated that they found the process of representing the nature of  
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19 relationships between people useful: *“Thinking about the relationship between two*  
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21 *people triggered thoughts about other relationships (P2)”*; *“Helps to remember,*  
22  
23 *thinking who was there and then who they were with, using the links (P4)”*; *“Making*  
24  
25 *it visual makes it easier to remember and not lose track of who you’ve added or not*  
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27 *(P29)”*; *“It made me remember little details about the event, specifically the amount*  
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29 *of laughter and conversations shared between everyone (P60)”*.  
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## 35 Discussion

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37 Given that the aim of this study was to establish the basic usability of the  
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39 RING task software, the findings are promising – 124 participants reported  
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41 information about groups of individuals and the relationships between those  
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43 individuals in a visual and easy to interpret format using the software.  
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47 There are a number of important issues for future research to consider. First,  
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49 evaluating the accuracy and completeness of the information reported was outside the  
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51 scope of this initial study. We did not have ‘ground truth’ about the individuals  
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53 attending the events described and, indeed, this would have been incredibly difficult  
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55 to collect or corroborate for such a diverse set of personally experienced events over  
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57 an extended period. Second, although it is unlikely that simply asking people to list  
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3 the individuals they remember will be more effective than asking them to engage in a  
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5 visual task, such as that supported by the RING task software, future research should  
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7 test the performance of the RING task against other elicitation methods (e.g. standard  
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9 interviewing). Third, the performance of the RING task may be improved by the  
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11 integration of retrieval support techniques such as mental reinstatement of context, or  
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13 the use of rapport building, which can be critical for encouraging the unrestricted  
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15 reporting of information, especially in intelligence-type interviews (Kelly, Miller,  
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17 Redlich, & Kleinman, 2013). Fourth, future research should examine whether  
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19 completing the RING task has additional retrieval benefits, as might be predicted by  
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21 theory pertaining to retrieval practice (see Roediger & Butler, 2011) and associative  
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23 networks theory (e.g. Anderson, 1983). Fifth, investigators and HUMINT officers are  
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25 rarely only interested in the individuals involved in networks - other details (e.g.  
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27 meeting times, locations, content of meetings, plans, resources) are likely to be  
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29 important. Therefore, it will be important to assess how the RING task integrates with  
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31 other information elicitation methods for use with cooperative sources, such as the  
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33 timeline technique (Hope, Mullis, & Gabbert, 2013). The benefits of a talk-aloud  
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35 protocol while completing the task should also be examined. Finally, while there is a  
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37 precedent in the literature for the analogical methodology used here (i.e. recalling a  
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39 family gathering), this methodology may not mimic the applied context precisely.  
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41 There may well be features of criminal network membership (e.g. use of multiple  
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43 nicknames or different types of relationships) that cannot be examined systematically  
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45 in this more anodyne context. As such, more ecologically valid future tests of the  
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47 RING task should be conducted in relevant applied contexts. Additionally, the  
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49 network diagrams elicited by the RING task should be evaluated by practitioners to  
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51 confirm that such visual representations deliver (i) usable intelligence information,  
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- In this article, we report the development of an innovative piece of information elicitation software, called the Reporting Information about Networks and Groups (RING) task, designed to facilitate the reporting of information about networks of individuals and the relationships between them.
  - Although further research is necessary, given the importance of understanding human networks in order to disrupt criminal activity, the RING task may contribute to intelligence gathering and the investigation of organised crime gangs and terrorist cells and networks.
  - The RING task reporting software can be accessed here:  
<https://forcegraph.netlify.com/>; For a demonstration video see here:  
<https://www.youtube.com/watch?v=1jGHCFa0XSM>

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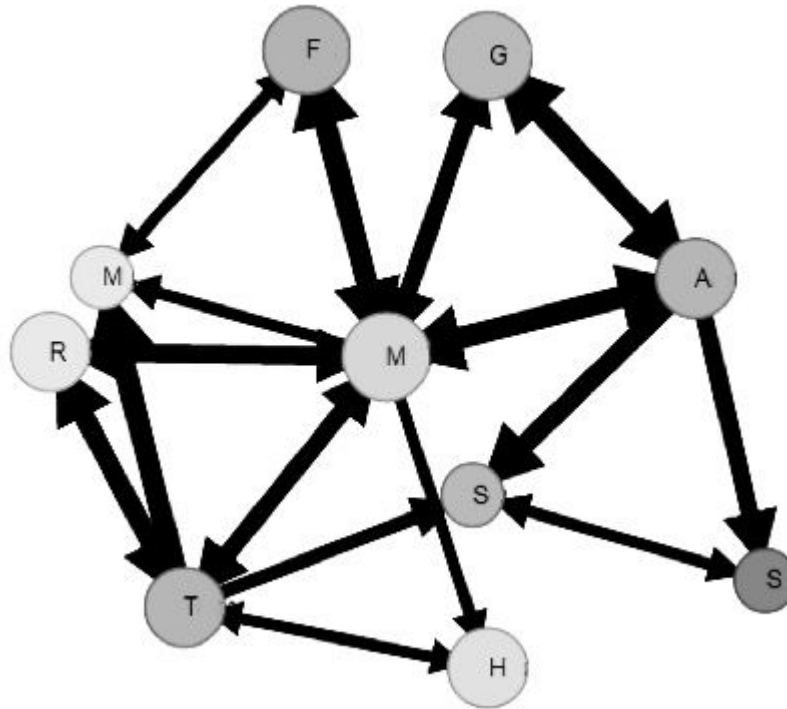
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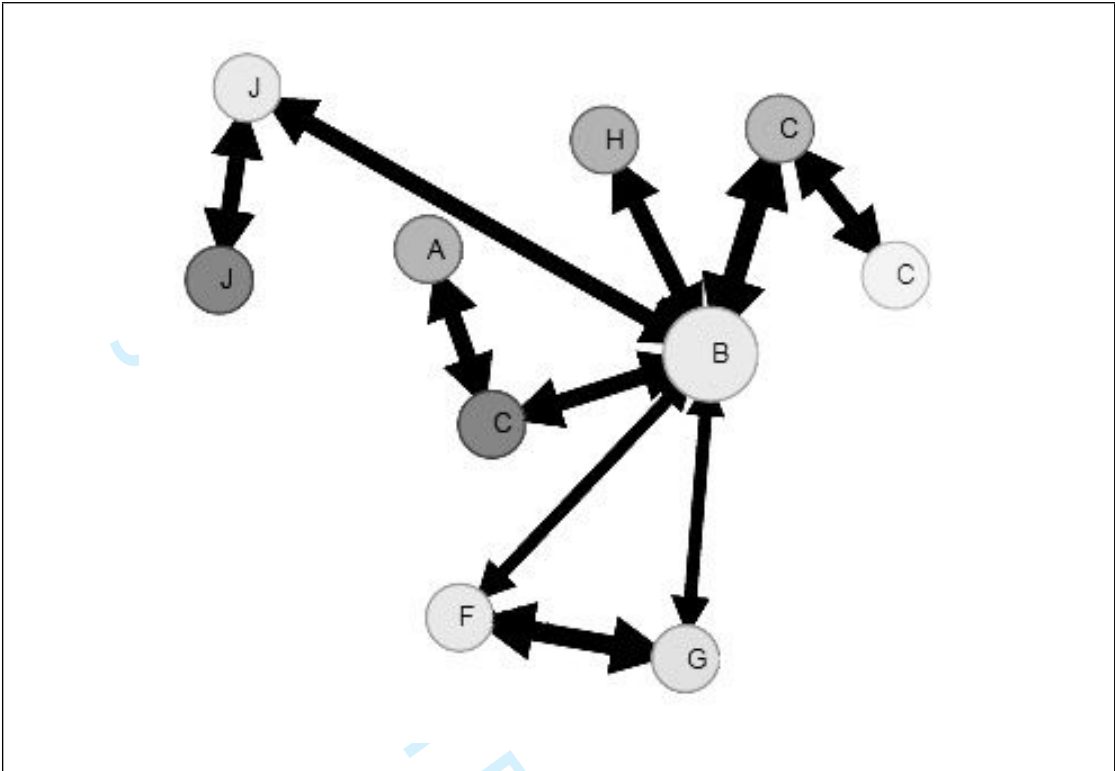
Figure 1. Example of relationships reported using the Ring Task software (target name anonymised)

Panel A: Example of relationships at a family event reported using the Ring Task software.

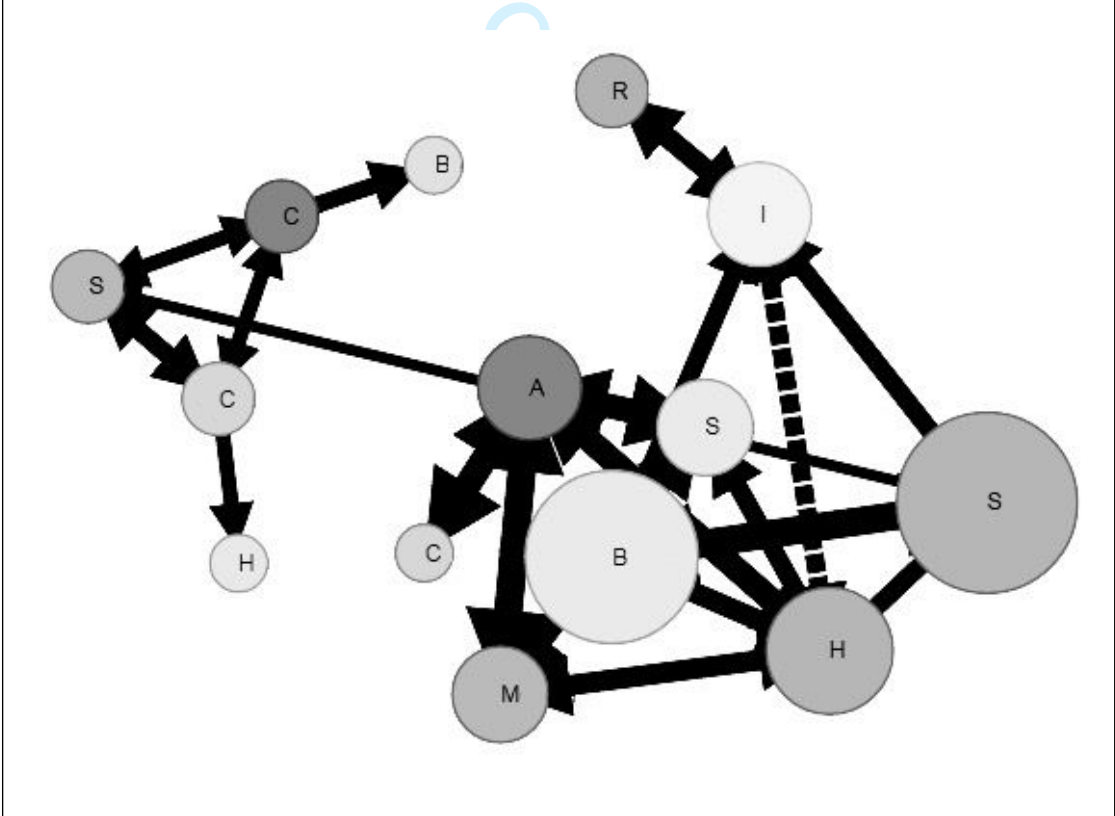


Panel B: Example of relationships in a friendship event reported using the RING Task software.

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Panel C. Example of relationship clusters reported using the RING Task software.



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