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Title: Using the Colored Eco-Genetic Relationship Map (CEGRM) with Children

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Abstract: Background: The Colored Eco-Genetic Relationship Map (CEGRM) is a hybridized assessment tool that combines the ecomap, family genogram, and genetic pedigree, to produce a unique, participant-generated picture of an individual's social networks and information exchange patterns. To date, the CEGRM has been used successfully with adults, providing insights into their social networks and the communication patterns they use in the update and exchange of health-related information.

Objective: The purpose of this study was to explore the feasibility and utility of adapting the CEGRM for use with children.

Method: 20 children, 7-10 years of age, distributed by sex, socioeconomic status, and geographic heritage, participated in one-on-one sessions in which they constructed a CEGRM using adapted art-directives. A qualitative descriptive design was used.

Results: Children were able to construct a CEGRM successfully and, as with adults, discussions provided considerable insights. A focused analysis revealed kaleidoscopes of social networks being accessed by today's children, as well as surprising information exchange sources and patterns. While all included one parent, family composition varied. Extended family members, other

adults, peers, and media sources were not only prevalent, but also often preferred over family as sources of health-related information. Of particular interest was children's movement away from mothers as their primary source of health-related information.

Discussion: The CEGRM is easily adapted for use with children using children's drawings. It may prove to be an effective, adjunctive assessment and/or interventional tool for parents, researchers, educators, and providers working with young children.

Key Words: lay beliefs, social networks, children, genetics, art-based inquiry

September 22, 2008

Molly C. Dougherty, PhD, RN, FAAN
Editor

Dr. Dougherty:

I am submitting an article entitled Using the Colored Eco-Genetic Relationship Map (CEGRM) with Children. This article is my original work and has not been published or submitted for publication elsewhere. I am the only author on the manuscript.

I have no conflicts of interest.

The research presented in the article was approved by The University of Iowa IRB FWA# 00003007.

Thank you for your consideration of this manuscript.

Kind regards,

A handwritten signature in cursive script that reads "Martha Driessnack".

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Manuscript Title: *Using the Colored Ecogenetic Relationship Map (CEGRM) with Children*

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Title Page

Using the *Colored Eco-Genetic Relationship Map (CEGRM)* with Children

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1 **Abstract**

2 **Background:** The *Colored Eco-Genetic Relationship Map (CEGRM)* is a hybridized assessment
3 tool that combines the ecomap, family genogram, and genetic pedigree, to produce a unique,
4 participant-generated picture of an individual's social networks and information exchange
5 patterns. To date, the *CEGRM* has been used successfully with adults, providing insights into
6 their social networks and the communication patterns they use in the update and exchange of
7 health-related information.

8 **Objective:** The purpose of this study was to explore the feasibility and utility of adapting the
9 *CEGRM* for use with children.

10 **Method:** 20 children, 7-10 years of age, distributed by sex, socioeconomic status, and
11 geographic heritage, participated in one-on-one sessions in which they constructed a *CEGRM*
12 using adapted art-directives. A qualitative descriptive design was used.

13 **Results:** Children were able to construct a *CEGRM* successfully and, as with adults, discussions
14 provided considerable insights. A focused analysis revealed kaleidoscopes of social networks
15 being accessed by today's children, as well as surprising information exchange sources and
16 patterns. While all included one parent, family composition varied. Extended family members,
17 other adults, peers, and media sources were not only prevalent, but also often preferred over
18 family as sources of health-related information. Of particular interest was children's movement
19 away from mothers as their primary source of health-related information.

20 **Discussion:** The *CEGRM* is easily adapted for use with children using children's drawings. It
21 may prove to be an effective, adjunctive assessment and/or interventional tool for parents,
22 researchers, educators, and providers working with young children.

23 **Key Words:** lay beliefs, social networks, children, genetics, art-based inquiry

1 **Introduction**

2 Health literacy and education research indicate that individuals come to health care
3 encounters with pre-existing personal frames of reference or mental models that influence their
4 interpretation and uptake of health-related information (IOM, 2004; Lanie et al, 2004; McClean
5 & Shaw, 2005; Walter, Emery, Braithwaite & Marteau, 2004). When new information is
6 presented that conflicts with an individual's pre-existing understandings, or *lay beliefs*, the latter
7 prevail (Forrest, Currow, Delatycki, Skene & Aitken, 2008; Higginbottom, 2008; Lock,
8 Freeman, Sharples & Lloyd, 2006). As such, lay beliefs function as powerful mediators of public
9 understanding and health literacy. If health care providers and educators do not acknowledge
10 these beliefs, health information that could positively impact an individual's decision-making
11 about health promotion, risk reduction behavior, and/or treatment adherence may ultimately be
12 misunderstood or mistakenly ignored. While health care providers have traditionally functioned
13 as gatekeepers of new or emergent health-related information, research has shown that the *uni-*
14 *directional* provision of such information does not appear to be enough to increase public
15 understanding or effect change in health promotion, risk reduction behavior, or treatment
16 adherence behaviors (Collins, Drew, Watt & Entwistle, 2005; Sturgis & Allum, 2004). The need
17 to incorporate an individual's prior understandings or lay beliefs is apparent and may require
18 more engaged, interactive, or *bi-directional* approaches, especially as individuals and families
19 begin to process genomic and technological advances in the understanding of disease causation,
20 disease risk, and inheritance (Bates, 2005).

21 **Background**

22 Research suggests that adult lay beliefs are rooted in our *naïve theories of biology*
23 (Hatano & Inagaki, 1994; Inagaki & Hatano, 2002; Rowlands, 2001). Naïve theories of biology

1 develop during childhood, influenced and reinforced in children's social worlds, including
2 familial and extra-familial interactions and ever-expanding media and electronic technology.
3 These early theories, which serve as the primary frameworks and building blocks for our future
4 understanding of health, disease, and inheritance, and disease risk begin to form as early as seven
5 years of age, long before formal biology or health education. Of further importance is that once
6 the theories form, which typically occurs by ten years of age, they are resistant to change
7 (Hatano & Inagaki, 1994; Inagaki & Hatano, 2002). While research documents that the
8 fundamental structure of these naive theories is consistent across cultures, differences in
9 children's ecological or social contexts affect how the structure is put to use or accessed as new
10 information or concepts are introduced (Medin & Atran, 2004; Raman & Gelman, 2005).
11 Engaging children during this formative period (7-10 years of age) may provide a rich
12 opportunity to learn more about the social networks and information exchange patterns in which
13 naïve theories of biology and foundational understandings of health, disease, inheritance, and
14 disease risk develop and thrive. It may also provide clues to how health care providers and
15 educators begin to understand how to access adult lay beliefs, how deeply rooted these beliefs
16 are in individual's lives, and how lay beliefs are nurtured and supported across the lifespan (Pratt
17 & Fiese, 2004).

18 The *Colored Eco-Genetic Relationship Map (CEGRM)* (Kenen & Peters, 2001) is an
19 interactive art-based assessment tool used with adults that has provided considerable insight into
20 adult social networks and communication patterns of new health-related information and lay
21 beliefs in families with hereditary cancers (Koehly et al, 2008; Peters, Kenen, Giusti, Loud,
22 Weissman & Greene, 2004; Peters, Hoskins, Prindiville, Kenen & Greene, 2006). The *CEGRM*
23 blends the *ecomap*, *family genogram*, and *genetic pedigree* to produce a participant-generated

1 picture of that person's social networks of support and information exchange patterns. While
2 ecomaps, genograms, and pedigrees individually have a particular focus and standardized system
3 for documentation, individually they often do not adequately represent the whole of an
4 individual's life (Olsen & McMullen, 2004). Combining them enhances a provider's ability not
5 only to visualize disease risk and inheritance patterns but also puts it in context for that
6 individual. Such context has the potential to personalize interventions and enhance resources.
7 The *CEGRM* begins with the construction of a three generation genetic pedigree (Figure 1A).
8 Blending in components from the ecomap, the pedigree is then expanded to include other
9 important members in the individual's social network. Once complete, the individual is asked to
10 identify patterns of information exchange and support. Their answers are documented by placing
11 color coded dots and stars on the drawing. This last step blends in components of the genogram.
12 An example of a completed adult *CEGRM* is shown in Figure 1B.

13 To date, the *CEGRM* has not been used with children. However, there is increasing
14 interest in the use of art-based inquiry and assessment with children. This study represents the
15 first attempt to adapt the *CEGRM* for use with children using the children's drawings.
16 Considered a natural medium for children, art allows children to use internal sensory cues for the
17 retrieval of information and experiences. Traditional methods of self-report (e.g. surveys,
18 questionnaires, and directed interviews) tend to rely on external semantic cues for the retrieval of
19 information, which privileges adult communication, making these approaches more adult-
20 directed and -centered (Salmon, 2001). A meta-analysis exploring the effect of integrating art-
21 based inquiry into research with children demonstrates that incorporating children's drawings
22 into an interview process can be a robust intervention (Cohen's $d = .98$) (Driessnack, 2005).

23 **Purpose**

1 family health, and its broad appeal to diverse families. The YMCA was also the site of data
2 collection.

3 *Procedure*

4 Data collection took place in one-to-one sessions with each child. Instead of using the
5 adult approach to the *CEGRM* that begins with the construction of a genetic pedigree, the
6 directive was adapted by having the children begin by drawing their family. No specific directive
7 was given as to how 'family' was defined. Children were offered a variety of art media/paper
8 types to choose from. Once their family drawing was complete, the children were asked to add
9 any other sources of support and/or information *outside* their family to the drawing.

10 Once these additions were made and their social networks complete, the children were
11 instructed to place green and red pre-cut self-adhesive circles and stars on their drawing in
12 response to three lines of questioning. First, children were asked where (on their drawing) they
13 would go for answers if they had questions about how to be/stay healthy? They put a green circle
14 next to each identified source. They were then instructed to put a green star next to which was
15 the one source they would listen to above all others. Children were then asked to place red circles
16 next to the sources to whom they would not go and a red star next to the one source who would
17 be the very last person to whom they would listen. The same process was used for a second and
18 third set of health-related questions asking children where they would go for information about
19 the inside of their body and how it works and where they would go if they had questions about
20 the types of things that are inherited and how they are passed down or run in families.

21 Children were reminded throughout the process that they could add to their drawings as
22 needed. However, none of the children ever added anyone or anything beyond their initial
23 drawings. None of the children hesitated or demonstrated any difficulties as they drew, added

1 decorative embellishments, or shared stories about their drawings or selections. An example of a
2 completed *CEGRM* is provided in Figure 2 with researcher markings. The specific art directives
3 and questions included in the interview guide are provided in Table 2.

4 The children's comments were recorded and analyzed using qualitative description
5 (Sandelowski, 2000). Each child's data was reviewed first within and then across the data for
6 recurring content and themes (Ayres, Kavanaugh & Knafl, 2003; Graneheim & Lundman, 2004).
7 In addition, the researcher maintained a field notebook, specifically focused on children's
8 selection of art supplies, their spontaneous comments and questions, as well as any specific
9 challenges shared or observed in the process. The primary focus of the field notebook recordings
10 was to gather information about the feasibility of using this process with children. The
11 qualitative analysis of the children's descriptions was undertaken to evaluate the utility of the
12 tool. The particular focus was on exploring face validity, looking at the nature of the information
13 gained from the children in the process and whether or not it was comparable to the nature of
14 information or kinds of insight gained using the *CEGRM* with adults.

15 **Results**

16 Each child was able to complete the entire process without verbalized or demonstrated
17 difficulty in less than 20 minutes. The average time was 12 minutes with a range of 8-20
18 minutes. The children's artistic skill varied, but this had no impact on their ability to
19 communicate clearly about their social worlds or preferred information sources for health related
20 information (Figure 3). All of the children began with a pencil. While some children used the
21 pencil throughout, most chose to mix media. While no patterns of media selection were
22 identified by age or sex, each of the children did demonstrate specific preferences, carefully
23 selecting their preferred media and rarely using more than two. There was no hesitation in

1 drawing their families and no questions or need for clarification of instruction about who or what
2 to add when asked to expand the drawing to include other sources of information. Further, none
3 of the children showed any hesitation or fine motor difficulties placing the colored circles or
4 stars.

5 The children were given control of the art media they chose to use and of their parents'
6 whereabouts during data collection. All of the children asked their parent(s) to wait outside or at
7 a distance as they worked. Only one male child consulted his mother during the process to
8 inquire what dress she wanted him to draw on her.

9 Each of the children's *CEGRMs* was unique, providing surprisingly simple, yet insightful
10 glimpses into their social networks or worlds. While all included one parent, family composition
11 varied and extended family, peers, non-family adults, and media sources, such as the *Internet*,
12 computer, and television, were not only prevalent, but also often the children's preferred sources
13 of answers to proposed health-related questions. The size of their self-identified social networks
14 ranged from 5-15, with a *mean* = 7.2, *mode* = 7, and *median* = 7. Thirteen (65%) of the children
15 included media sources for information and support in their drawings. Of the seven who did not
16 include media in their social network, only three were in the lower socioeconomic group. Pets
17 were often spontaneously included as family members, but not as valued information sources.

18 Of particular interest is that children's selections of valued sources varied with the type of
19 questions asked. In response to the first line of questioning, only 20% (4) of the children
20 identified mothers as their preferred source for *health-related information*. This stands in
21 contrast to assumptions in research and practice where mothers are often considered the primary
22 source of information for and about their children. As one child shared, *my mom has a little*
23 *weight issue and is not the best person for staying healthy stuff, but she does know about girls'*

1 *bodies and stuff and she is really pretty good about giving details.* Females were preferred over
2 males as sources of information for 90% (18) of the children, with children identifying
3 grandmothers, teachers, aunts, peers' mothers, and female health care providers as preferred
4 sources of new information. The remaining 10% (2), both male, identified the *Internet* as the best
5 source. In contrast, 80% (16) shared that they would specifically avoid information from the
6 male adults in their networks. Further, any male adults identified in their social networks were
7 restricted to family members - fathers, stepfathers, grandfathers, or uncles. No male coaches,
8 teachers, or health care providers were mentioned. None of the children identified a peer as a
9 'best' source, but peers were often identified as valued or important sources of health
10 information and support.

11 In response to the second line of questions about the *inside* of their bodies, all but one
12 child (95%) showed a preference for same sex individuals, but only 45% (9) of these individuals
13 were adults. Forty per cent (8) chose a same sex peer, while 10% (2) chose an older same sex
14 sibling as their preferred sources for information. One female child shared, *boys can be smart,*
15 *but they don't know anything about girls.* While another female child specifically identified an
16 older female sibling as a poor source saying, *she says she can't figure out how she got*
17 *pregnant... even I know and I'm 6 years younger...see why I wouldn't pick her... she should*
18 *have come to me.* One child identified the *Internet* as the preferred site for his body questions.
19 His family drawing and social network contained no males and was limited to his mother, his
20 'other' mother, a female teacher, the library, and a personal computer (Figure 4).

21 The children's identified and preferred sources of information when asked the third set of
22 questions about *inheritance* were also insightful. All but one child (95%) selected a family
23 member as the one preferred source they would listen to above everyone else. Of the varied

1 study that children as young as seven are capable of constructing them too. When constructing
2 the *CEGRM* with adults the process typically begins with a hand or computer generated genetic
3 pedigree. However, adapting the *CEGRM* using children's drawings provided equally intimate
4 glimpses into the unique social networks and health information exchange patterns of children.
5 Health care providers, researchers, and educators are quickly apprised of children with
6 limited/expanded social networks, limited/expanded sources of support, and potential hazardous
7 information sources or networking. As such, the *CEGRM* may prove to be an effective,
8 adjunctive assessment tool for health care researchers, educators, and providers working with
9 young children and families. Rather than relying on traditional *uni*-directional dissemination of
10 information to parents, or more specifically mothers, for dissemination to their children, the
11 *CEGRM* may serve as a cost-effective shortcut or interventional mediator that highlights
12 information sources of influence in a child's world and where efforts need to be directed if
13 interventional efforts are to be effective.

14 It is clear in this study that children as young as seven years of age are able to complete
15 this process without difficulty. Further, the quality of information gained was consistent and
16 unrelated to children's artistic skills. Of particular interest were the kaleidoscope of social
17 networks identified and the changing face of information sources that emerged. Mothers were
18 rarely identified as a preferred or valued source of health related information. Instead, children
19 identified grandmothers and other primarily female sources, as well as media or electronic
20 sources. This has important implications for health care providers and educators who have long
21 assumed that providing information to a child's mother was the best approach to reaching a
22 child.

1 The emergence of media technology as an integral part of children's lives is well known
2 and certainly evident in the children's drawings. Television, which until recently was the
3 dominant media source, is now joined by cell phones, *iPods*, video games, instant messaging,
4 social networks on the *Internet*, and e-mail (Roberts & Foehr, 2008). Today, media exposure
5 begins early, peaking at eight hours daily among children 9-12 years of age. As one child
6 expanded her drawing to include her other sources of information and support, she said, *Well,*
7 *first I'll put in my '5 favs',* from her cell phone 'buddy' list. Another child added an *iPod*, TV,
8 and her personal computer, *which is connected to scientists and stuff over here through these*
9 *Internet waves, so it's real, [you know], to be believed* (Figure 2).

10 Today's children, growing up at the intersection of the genomic era and information age,
11 present providers and caregivers with a number of challenges. Understanding and accessing their
12 expanding social worlds and sources of influences is one. Engaging children in an interactive
13 approach to health-related education might also serve as a model for more *bi-directional*
14 processes in educational approaches with adults. Ineffective health communication can result in a
15 wide range of direct and indirect health consequences (Vahabi, 2007). Shifting some of the
16 authority from the teacher to the learner, no matter how young or old that learner is, may well be
17 the first step in our ability as health care providers, researchers, and educators to understand not
18 only the impact of lay beliefs on the interpretation and uptake of new health-related information,
19 but also on the eventual adoption of positive health promotion and risk reduction behaviors.

20 This study involved a small cross section of young healthy children accessed through a
21 community site. Further studies that include larger numbers, a wider range of ages and
22 geographic heritage, children who have specific diseases, or are hospitalized may provide
23 stronger support for the utility of the *CEGRM* across the lifespan and health-illness continuum.

1 Because naïve theories of biology not only lay the framework for later adult lay beliefs
2 but also are reinforced and nurtured by them, it is important to include children in the exploration
3 of lay beliefs. Children not only have privileged information about themselves, their worlds, and
4 their experience, but they are deserving and very capable of articulating them. The continued
5 development and evaluation of child-centered and –directed approaches to data collection is
6 important as the demand for children’s participation in research has increased and the research
7 shifts from seeking information *about* children to seeking information *from* them. Children’s
8 drawings may well be worth a thousand words, but only if we listen.

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Figure Legends

Figure 1. Adult *CEGRM* using a computer generated pedigree [A] as the first step. The pedigree is then expanded to include extra-familial resources and marked using colored circles/stars in response to line of questions [B]. The individual of interest is identified by the arrow.

Figure 2. Child *CEGRM* using child's drawings as the first step. This 9yo ♀ identifies the important sources of health-related information in her social network [A] uncle who lives downstairs, identified as a good resource for health information, but not for inheritance questions [B] child's father who is this child's preferred source of information about inheritance questions [C] child (cell phone in her hand) [D] child's mother who is identified as a poor source of health information and is pictured asleep [E] child's best friend's mother who is identified as this child's preferred source of information about health questions, but not about inheritance [F] child's best friend (cell phone in her hand) who is identified as a good source of information about health, but not about inheritance. Other important resources for this child include her *iPod* (identified as a poor source of information), TV, and computer which is identified a good source of health information because it is connected to scientists (note the information waves).

Figure 3. Varying artistic skill and age did not interfere with children's ability to communicate needed information. *Figure 3a* (7yo ♂); *3b* (7yo ♂); *3c* (10yo ♀); *3d* (8yo ♀)

Figure 4. 10yo ♂. This child's social network had no male resources. For questions about his body, he chose the *Internet* as his preferred source of health information.

Figure 5. 8yo ♂. One child could not decide between his mother and God [see 'HELLO' bubble from the sky] as his most valued source of information about how things are inherited or run in families.

Table 1

Sample Demographics

N=20

Distribution by age: 7 yrs (6), 8 yrs (5), 9 yrs (5), 10 yrs (4)

Sex: 12 ♀; 8 ♂

SES: Free/reduced lunch (11)

 No assistance (9)

Geographic heritage/ethnicity:

 African American (4)

 Asian American (2)

 European American (9)

 Hispanic American (5)

Table 2

Interview guide for CEGRM using children's drawings as the focal point

Art supplies: Choice of white/manila 11x17 paper
 Choice of art media (black/colored pencils, crayons, wide/narrow tipped markers)
 Sheet of green/red colored self-adhesive circles
 Sheet of green/red colored self-adhesive stars

Art directives/interview questions:

- Draw a picture of your whole family
- Other than family members you have already drawn, is there anyone else *in your family* you would go to if you had a question, or for information, or if you wanted to know something, or learn something new, or when you are with them you learn a lot.
- Add them to your drawing.
- Now, I want you to think if there is anyone who is NOT in your family who you would go to if you had a question, or for information, or if you wanted to know something or learn something new, or when you are with them you learn a lot.
- Add them to your drawing.

*Take time for child to reflect on drawing. Probe if anyone or anything is missing.
 Remind child s/he can add to the drawing at any time as s/he proceeds with the process*

Shift to asking series of 3 questions (using same probes with each question)

Question 1: If you had a question about your health or how to stay healthy.

- Where (in the drawing) would you go for an answer to this question?
Child places green self-adhesive circles next to person(s) or item(s)
- Of these, which is the 'best' source? The one you would most likely to listen to?
Child places green self-adhesive star here
- Where (in the drawing) would you NOT go or would you avoid for an answer to this question?
Child places green self-adhesive circles next to person(s) or item(s)
- Of these, which is the very last one you would go to or purposefully avoid because you would never listen to what was said?
Child places a red self-adhesive star here

Question 2: If you had a question about your body, either on the inside or outside, how it works, or what could go wrong? [same probes as Question 1]

Question 3: If you had a question about something that may be inherited, run in a family, get passed down generation to generation, in your genes or your DNA? [same probes as Question 1]

Figure1
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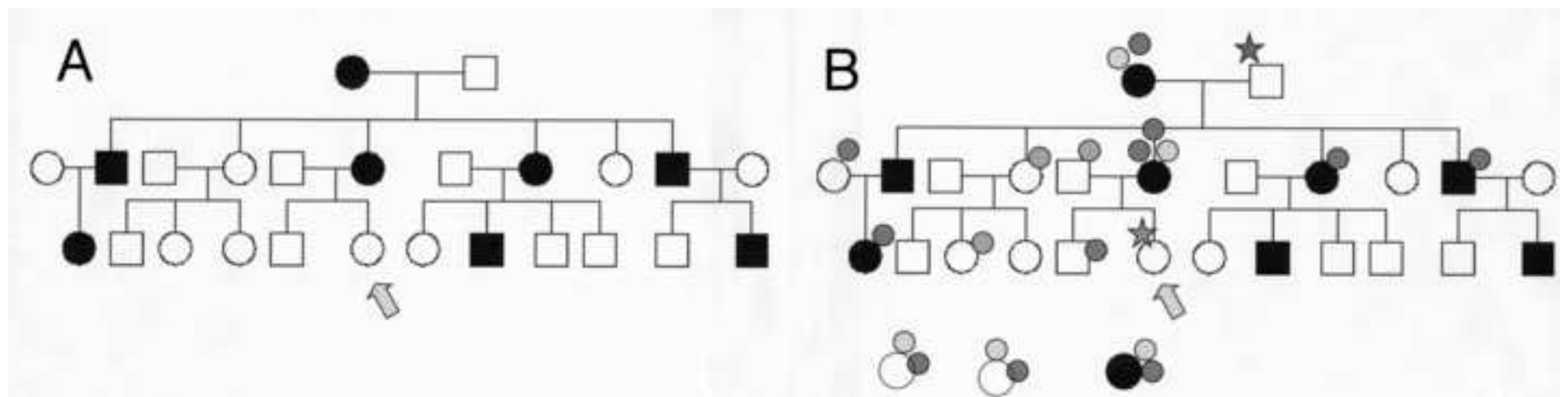


Figure 2
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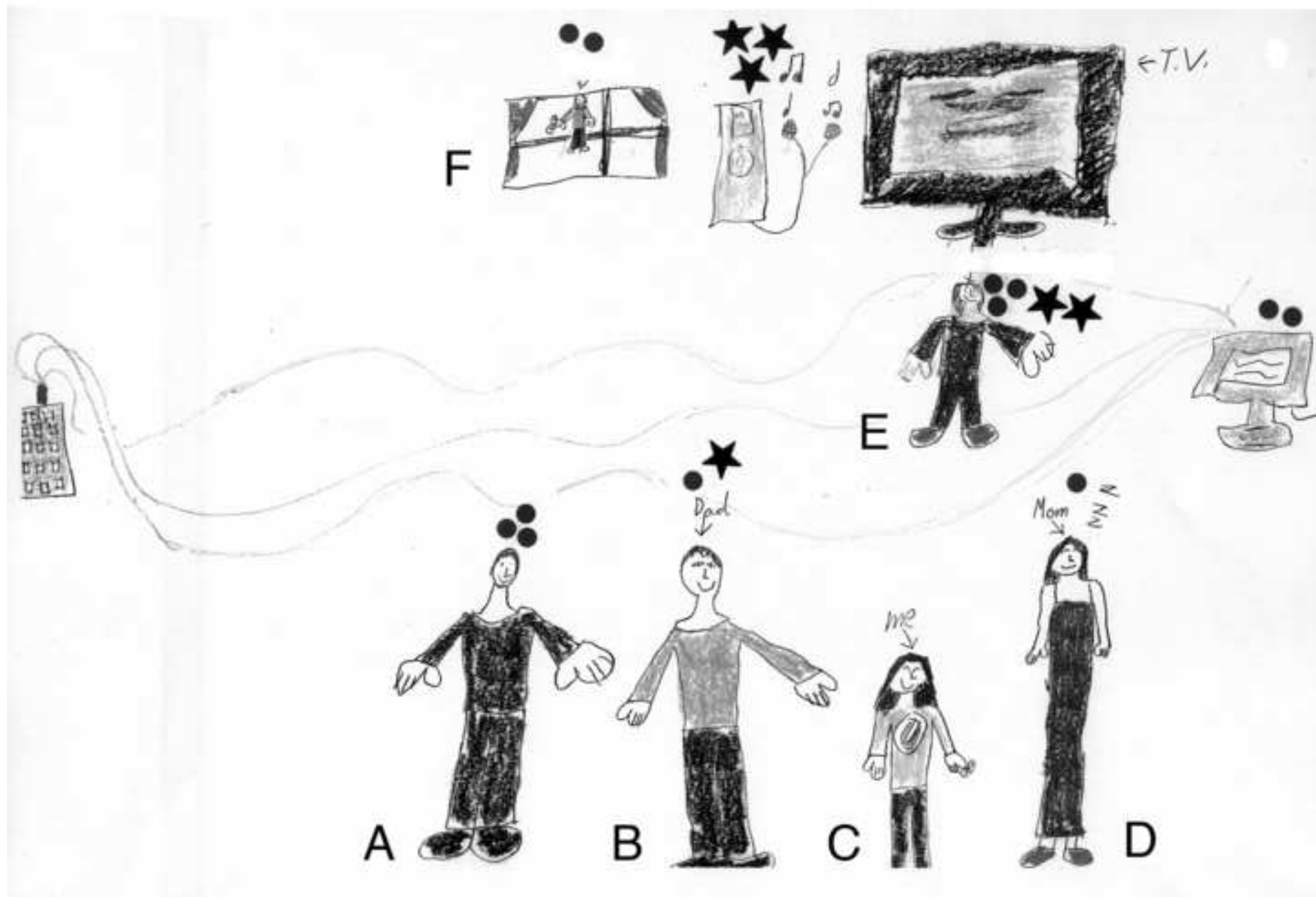


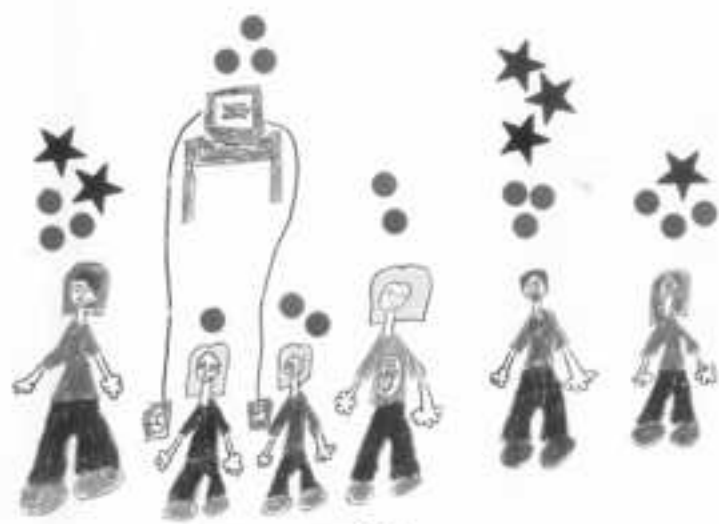
Figure3
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A



B



C



D

Figure4
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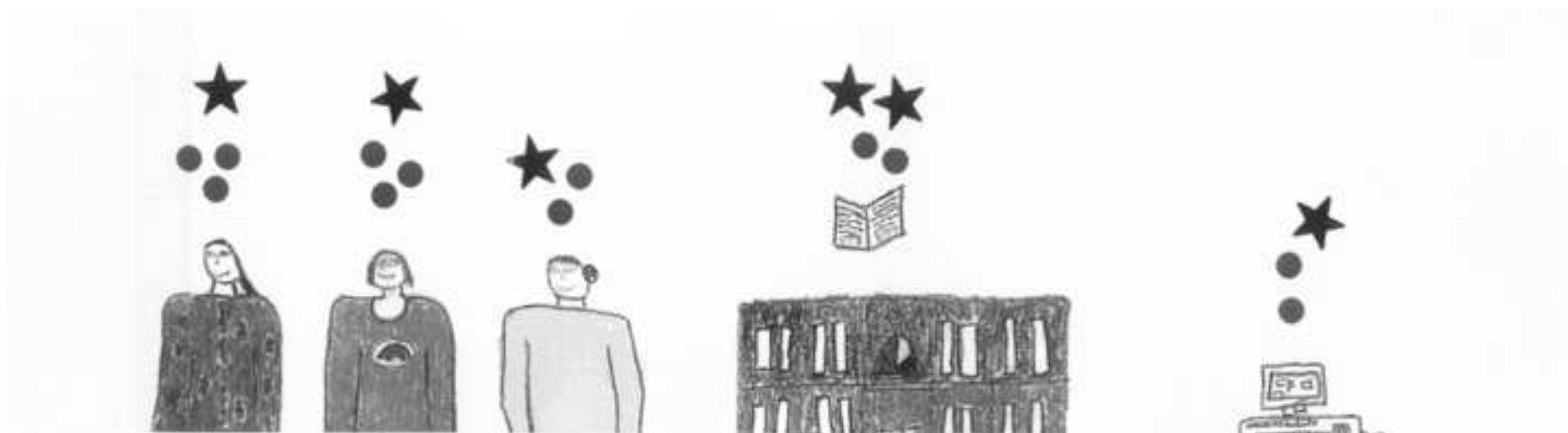


Figure5
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