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The role of sharing and information type in children's categorization of privileged and conventional information

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ABSTRACT

One domain that has not been thoroughly investigated is children's ability to categorize information, specifically conventional (known to others, no restrictions on sharing) and privileged (not known to others, restrictions on sharing). In Study 1, 73 four- and five-year-olds and adults classified conventional and privileged information by how it is shared. All age groups accurately classified the information types, though accuracy improved with age. In Study 2, 68 four- and 6-year-olds and adults were presented with scenarios where information type and how it was shared did not match (privileged but shared) and asked if it was conventional or privileged. Four-year-olds and adults categorized conventional information by its label and did so more than 6-year-olds, while there was no pattern for privileged information. These results support that even 4-year-olds can distinguish between conventional and privileged information, and categorization strategies may differ across age and type of information.

There is a substantial body of research dedicated to children's categorization strategies that have culminated in conceptual models (for example see Gelman, 2003; Keil, 1992; Murphy, 2004). Conceptual models provide the foundation to explain how children think about a category, allowing for the creation of structured, cohesive, and integrated mental representations of the world (Murphy, 2004). This is a key goal of research in cognitive development, to understand how children learn and integrate knowledge into their developing categories and concepts. There is extensive research on children's categorization in domains such as natural kinds, artifacts, and human kinds, which have culminated in theoretical perspectives of conceptual development in these areas (for examples see German & Johnson, 2002; Owen & Barnes, 2019; Rhodes, 2013). One domain where research is more limited is in children's categorization of information. Information is operationalized as communication in any modality (e.g., direct instruction, printed, overheard) that describes or informs about a person, situation, or event. Information is different from the physical items or constructs it describes, rather it is specific to the conveyance of such items. Much of our ability to successfully interact with our world is based on the acquisition and appropriate dissemination of said information.

Not all such acquired information is the same nor is one always informed if it can be shared with others or not. Some information is *conventional* in nature and is available to everyone without any restrictions on its dissemination. Conventional information encompasses a culture's shared social norms, values, language, communication styles, and general knowledge of the world (e.g., names of natural kinds and numbers, cultural artifacts, game rules; Csibra & Gergely, 2009; Diesendruck, 2012). Properties that are common to all conventional information are the following: a) generic, or generalizable to other similar kinds; b) specific to one's culture, e.g., the

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label of 'cow' to a domestic bovine animal is specific to English speakers; c) prescriptive, or normative; d) expected to be understood by others in one's culture and e) can be shared with anyone under any circumstances (Diesendruck & Markson, 2011; Lewis, 1969). Conventional information is specific to those items that are expected to be known at the cultural level (e.g., dog) and does not include idiosyncratic information, which is specific to certain people (e.g., family pet dog's name is Max; Diesendruck & Markson, 2011).

In contrast, other types of information are privileged in nature, which is not available to everyone, intentionally concealed, and restricted in its dissemination (Anagnostaki et al., 2010; Liberman, 2020; Vangelisti, 1994; Watson & Valtin, 1997). This definition encompasses taboos (e.g., sexual/physical abuse), rule violations (e.g., cheating), and breaking of social conventions or normative behavior (e.g., getting bad grades at school; Vangelisti, 1994; Vangelisti & Caughlin, 1997). Privileged information is person-specific, not considered generic, and not expected to be known by others. There are social norms for when and with whom one shares privileged information (Barasch, 2020; Bedrov, et al., 2021). Sharing privileged information under inappropriate circumstances or to inappropriate people (e.g., sharing personal information with a stranger in a grocery store line) is considered socially awkward and can serve to decrease potential interpersonal interactions (Rubin, 1975).

While there is evidence that children use types of information differently (Diesendruck & Markson, 2011; Henderson & Woodard, 2012; Liberman, 2020; Liberman & Shaw, 2018; Novack et al., 2014), there is limited evidence on how children are categorizing information (though see Anagnostaki et al., 2010; Behrend & Girgis, 2024). There are three possibilities for how children may do this. The first possibility is information is considered a natural, objective entity. If this were so, we expect children would categorize information by the *kind* of information it is, as determined by its category membership, typically carried by its category label or name. A second possibility is that children categorize information as if it was created by humans to meet a human need, in this case, communication. If this were so, we expect children would categorize information by its function or how it is used. One function of information is whether it is shared or not. The third possibility is that categorization strategies differ based on the type of information it is. Similar to conventional, most cultures have privileged information, for example, secrets and taboos. However, very young children's predisposition to treat incoming information as conventional appears to be an evolutionary adaptation, one explanation for how children learn as much as they do in such short periods of time (Csibra & Gergely, 2011). Knowledge of privileged information takes longer to develop, and is person-specific, not known by others, and with few exceptions should not be shared with others. Therefore, privileged information is an ideal type of information to compare to conventional to investigate these possible categorization strategies.

To our knowledge, categorization of these information types has not been previously empirically tested; however, we expect, at least for adults, that information is categorized by its category membership, rather than by whether it is shared or not. For example, passwords are classified as privileged information. However, if a person decides to share their password with the public, are passwords now classified as conventional information, or in this instance is it privileged information that was inappropriately shared with others? We expect shareability is a central property of information, especially for young children, in terms of what to share, when to share it, and to whom they should share it. However, sharing is not the defining property of information, and therefore, sharing or not sharing information does not change the type of information it is. In our example, we expect adults will continue to categorize passwords as privileged information even if it has been shared. Considering the critical role that being able to understand, distinguish, and appropriately use information plays during cognitive and social development, the goal of this research is to examine what criteria children and adults use when determining whether information is conventional or privileged.

While children are exposed to both types of information, most information acquired at a young age is considered conventional (Csibra & Gergely, 2009; Diesendruck, 2012; Mesoudi & Whiten, 2008; Tomasello, 2008). For example, children as young as 3-years will assume a stranger knows the name of novel objects even if the stranger was absent when the novel object was first labeled (Diesendruck & Markson, 2011), and infants as young as 9-months differentiate between conventional names of familiar objects and personal preferences or proper names (also known as idiosyncratic information; Diesendruck et al., 2015; Graham et al., 2006; Henderson & Woodard, 2012; Novack et al., 2014). Furthermore, young children expect that conventional information indicates knowledge that represents accurate cultural information. Children as young as 2-years-old will frequently correct those who label an object with an incorrect name (Kalish & Sabbagh, 2007) or who make a mistake when playing a game (Rakoczy et al., 2008). Andrási and Király (2021) extended these findings to pretend play situations with 3-year-olds able to distinguish between expecting a stranger to know the function of a common object, but not in the context it was used during pretend play.

In contrast, the bulk of research on children's knowledge of privileged information is specific to secrets and the circumstances in which they are shared. Five and 6-year-olds will differentially share a secret based on its content. For example, they will share dangerous (e.g., friend setting a fire) and guilty secrets (e.g., friend stealing money from mother's purse) with a mother, but not embarrassing (e.g., friend wetting pants) or innocent ones (e.g., surprise present for mother; Watson & Valtin, 1997). However, this changes in older age groups as 10- and 12-year-olds are less likely to share guilty and dangerous secrets, indicating an increased awareness of social consequences from peers, e.g., being ostracized by their social group. While 5- and 6-year-olds differentiated among types of secrets, they did not differentiate sharing secrets based on the severity of a violation (e.g., stealing versus not finishing lunch), though this shifted by age 9-years with fewer sharing minor violations compared to major ones (Loke et al., 2011). More recent research examined the social implications of secret sharing, including its effects on friendships and to whom it can be shared (see Bedrov et al., 2021 for an overview). For example, school-age children but not young children (3- to 5-year-olds) make social judgments based on secret sharing, such as only friends keeping secrets and sharing a friend's secret without permission can harm a friendship (Liberman, 2020; Liberman & Shaw, 2018). Yet even 4- and 5-year-olds show some ability to differentially share secrets; for example, they are more likely to share secrets with in-group members rather than out-group, even to the detriment of themselves (Misch et al., 2018).

There is less research that directly examines children's ability to distinguish between secrets and non-secrets. One of these direct

examinations, Anagnostaki et al. (2010), found 4- to 6-year-olds classified surprises and dangerous activities as secrets, and certain, impersonal descriptions as non-secrets (e.g., cousin has short hair), though it was not until 5.5- years-old that children were more adult-like in their designation of secrets and non-secrets. Used vignettes where a character was exposed to either conventional or privileged information and asked 3- to 5-year-olds and adults whether this information should be shared or not. While there were no age differences in endorsing characters' sharing conventional information, there were for privileged information. Though not similar to adult patterns, children judged that privileged information should be shared significantly less frequently than conventional information. However, 4-year-olds' judgments of sharing both conventional and privileged information were above chance.

1. Current research

The goal of the current research was to examine children's ability to differentiate between how conventional and privileged information are shared, and whether they categorize these information types by its category membership (label) or by its function (share or not share). Similar to Vangelisti (1994), the types of privileged information used in the current studies are those violations of conventional or normative behaviors, with which we expected young children to be more familiar. Rule violations were excluded so that children were not only using negative valenced scenarios to distinguish between privileged and conventional information. The list of privileged information is similar to the stimuli used in previous studies with similar age groups (Anagnostaki, Wright, & Bourchier-Sutton, 2010; Anagnostaki, Wright, & Papathanasiou, 2013; Peskin & Ardino, 2003; Watson & Valtin, 1997). The list of conventional information are ones that 4- and 5-year-olds have extensive instruction on (e.g., animals, objects, color labels) from parents and preschool teachers.

In Study 1, the aim was to determine whether young children can distinguish between conventional and privileged information. While previous research has found 4-year-olds have an emerging ability to distinguish between these information types, one possible explanation for their poor performance was that previous methodologies were too demanding for the general cognitive capacities. Previous studies used verbal questions, for example, by asking children to identify secrets from non-secrets (Anagnostaki et al., 2010), or by reading vignettes and asking whether the character should share what happened to them. For this study, 4- and 5-year-olds and adults were presented with colorful depictions of typical types of conventional and privileged information and asked children to classify it according to how it should be shared. With these methodological changes, we predicted both age groups would endorse sharing conventional information more so than privileged. However, based on the previous evidence that children's knowledge of privileged information is still developing, we expected 5-year-olds to more accurately endorse not sharing privileged information compared to 4-year-olds.

In Study 2, the aim was to examine whether information is categorized by its category membership, the kind of information it is as determined by its label, or by its function, specifically by whether the person decides to share it or not. Using previous methodologies for examining whether category membership versus appearance determines category membership (see Gelman, 2003 for an overview), we pitted category membership against function using a conflict task. Four- to 6-year-olds and adults were presented with two target pictures that represented privileged and conventional information and told the type of information it was and how it should be shared. A test picture was then presented to participants, where the researcher told participants the type of information it was but the opposite of how it should be shared, such that the category membership and function were mismatched. For example, secrets are privileged information but, in the scenario, it was shared. Participants were then asked which of the types of information in the target pictures matched that of the test picture. Six-year-olds were included in this study (instead of 5-year-olds) since it is not until closer to this age that children begin to differentially share and identify secrets from non-secrets. Since this particular research question has not been asked before, adults were tested as a baseline comparison group. Responses from all three age groups should reveal any developmental change in the criteria used to categorize different types of information.

We expect adults to categorize both types of information by the kind of information it is rather than by how it is shared. In part, because whether information is shared does not appear to be an essential or causal property to the type of information it is. While it breaks social norms to share privileged information or not share conventional, it does not change the type of information it is. Given that 6-year-olds are better at identifying privileged information, we expect they will identify privileged information by its membership rather than how it was shared. Considering 4-year-olds' more limited knowledge of privileged information, we predicted more variability in how they identified it. However, since young children are predisposed to treat incoming information as conventional, we expect 4-year-olds to categorize conventional information by its category membership more so than privileged information.

2. Study 1

2.1. Method

2.1.1. Participants

There were 73 participants: twenty-three 4-year-olds (M_{age} = 4;4, *range* = 3;8 to 4;9, 11 females), 25 five-year-olds (M_{age} = 5;4, *range* = 5;0 to 5;10, 9 females) and 25 undergraduate students (M_{age} = 20;0, *range* = 18;4 to 25;1, 16 females). The sample size is typical of this age group and research area (for example see, Anagnostaki et al., 2010; Diesendruck et al., 2010; Kim et al., 2014; Liberman & Shaw, 2018; and Loke et al., 2011). Adults were tested as a comparison group. Child participants were recruited from area preschools in a predominately middle-class community located in the south-central area of the United States. Participant ethnicity and primary language matched closely to the community's demographics, which is majority White (79.9%), and English-speaking (91.6%; US Census Bureau, 2019). The study was approved by the university IRB and informed consent was obtained from adults and

parents/guardians of child participants. Assent was obtained from child participants. The adults were undergraduate students in the same community who participated for research credit.

2.2. Materials

A total of 12 pictures comprised the stimuli for Study 1. These included 10 test pictures and 2 category label pictures. Pictures were colored clip art images taken from public domain online sources, such as Google Images, and were modified as needed in Microsoft Paint. Two category label pictures represented the two information categories. One depicted conventional information with a round yellow face and a hand cupping its open mouth indicating talking. The second depicted privileged information with a round yellow face and its finger to its lips indicating not talking. Each picture was approximately 4.5 in. x 4.5 in. and laminated, then taped to a wooden stick and affixed to the back of a shallow box.

A total of ten test pictures depicted conventional and privileged information, five for each information type. In parentheses following each type of picture is what the picture depicted and then the label the researchers used to describe it to participants. Conventional information: numbers, (numerals 1, 2, 3, 4, 5, 6; these are numbers up to 6); alphabet (alphabet letters written individually on blocks; these are the ABCs); an animal (dog; the name of this is a dog); a color (green circle; this is the color green); and an object (cup; the name of this is a cup). The label for the animal and object was to ensure that we were identifying it by its category (generic) rather than the specific dog and cup depicted in the picture. Privileged information: a secret (a girl whispering in the ear of another girl; this is a secret); present (a wrapped present; this is a birthday present); hide and seek game (children playing hide and seek; this is where someone is hiding in hide and seek) surprise party (balloons, streamers, and confetti; this is a surprise party); and a password for a clubhouse (child climbing into a tree house; this is a password to a clubhouse). All test pictures were approximately 3 in. x 3 in. See Appendix A for stimuli pictures and labels.

2.3. Procedure

All participants were tested by a single researcher. Child participants were tested in an empty classroom or a quiet area in their preschool. Adults were tested by multiple researchers in a laboratory on a university campus. The procedure took approximately 15 minutes to complete.

A familiarization task was first administered to participants, the purpose of which was to define conventional and privileged information for participants. Note that during the study, for both child and adult participants, the term 'public' was substituted for conventional, and 'private' was substituted for privileged as these are more familiar terms for young children. The terms used during the testing procedure (public and private) mapped directly onto conventional and privileged and were defined for the participants as if they were those information types. In addition, the specific examples of the information used in the study reflected conventional and privileged information.

The researcher first defined public information and provided an example ("The first new word is public. There are some things that you know, and you can tell anyone you want to tell. These things are called public. You can tell anyone about it. For example, if I learned that 1 + 1 is 2, I could tell anyone about it."). The researcher then defined private information and provided an example ("The second new word is private. There are some things that you know that you cannot tell anyone. These things are called private. You cannot tell anyone about it. For example, if I were playing a matching game, I could not tell the other person where the matching card was."). These definitions are similar to ones used in previous research for secrets and conventional information (see Anagnostaki et al., 2013; Watson & Valtin, 1997). The researcher asked two follow-up questions to ensure participant understanding, which were "So if you knew some things you could tell anyone about, is that public or private information?" and "So if you knew some things you could not tell anyone about, is that public or private?" If answered incorrectly, the researcher repeated the definition of both words and asked the questions again. The order of the questions and answer options (public or private) were counterbalanced across participants. Participants who could not answer the questions correctly the second time were excluded from the study. Questions were repeated twice for nine 4-year-olds and three 5-year-olds; however, all participants correctly answered the questions the second time.

Testing began immediately after the familiarization task. The two category label picture boxes were placed in front of the participant and the researcher sat next to the participant. After describing the category label pictures as public and private, researchers presented pictures one at a time to participants and asked if it belonged in the public or private box (e.g., "These are numbers. Should it go in the private, can't tell, box or the public, can tell, box? Put it in the box where you think it should go."). The procedure for adult participants was identical, except researchers explained that the study was being conducted by a cognitive development lab examining children's knowledge of different types of information.

Stimuli were arranged in a predetermined random order, such that there was no repetitive pattern when presenting conventional and privileged information (for example, not alternating or in blocks of two). There were two orders, the second was the reverse order of questions in the first order. Half the participants were given the first order and half the second. In addition, category label boxes were randomly placed in front of the participants, so that some participants had the public category label box on the left side while others had it on the right side. Lastly, the order of the category labels in the test questions (public/can tell and private/can't tell) was counterbalanced within and between participants.

3. Results

Participants' 'share' responses were coded with a 1 and 'not share' responses were coded with a 0. Two summary variables were

created for each information type by summing up scores for Conventional and Privileged information and dividing by the number of questions respectively. Alpha was set at .05, such that null hypotheses were rejected for p-levels less than .05 and designated p-values between .05 and .06 as trending towards significance.

A 2 × 3 (Information Type [conventional, privileged] x Age [4-year-olds, 5-year-olds, adults]) mixed ANOVA revealed a main effect of Information Type, such that participants endorsed sharing conventional information significantly more than privileged, $F(1,70) = 364.1$, $p < .001$, $\eta_p^2 = .83$, and an Age x Information Type interaction, $F(2,70) = 35.27$, $p < .001$, $\eta_p^2 = .50$. There was no main effect of Age, $p = .664$. A series of follow up tests were conducted on the interaction. A one-way ANOVA revealed significant differences in sharing response by age for conventional information, $F(2,72) = 27.90$, $p < .001$, $\eta^2 = .38$, and privileged information, $F(2,72) = 21.97$, $p < .001$, $\eta^2 = .44$. A Tukey's post hoc test revealed adults endorsed sharing conventional information significantly more often than the younger age groups, and 5-year-olds did so significantly more so than 4-year-olds, $ps \leq .018$. In addition, adults endorsed sharing privileged information significantly less than both younger age groups, $p < .001$, but there were no differences between the younger age groups, $p = .076$. Paired samples t-tests were conducted to examine differences in sharing responses between information types within each age group. These analyses revealed that adults, 5- and 4-year-olds endorsed significantly more sharing for conventional information than privileged information, $t(24) = 124.0$, $p < .001$, $d = 24.80$, $t(24) = 8.01$, $p < .001$, $d = 1.60$, $t(22) = 4.61$, $p < .001$, $d = .96$, respectively. See Fig. 1 for the percent of share responses by information type and age.

Examining each age group's sharing responses to chance with a one-sample t-test (test value = 50%) revealed adults endorsed sharing conventional information at above chance levels and at below chance levels for privileged, $t(24) = 61.5$, $p < .001$, $d = 12.30$. In addition, both 4- and 5-year-olds were at above chance levels for endorsing sharing of conventional information, $t(22) = 3.46$, $p = .002$, $d = .72$, $t(24) = 6.30$, $p < .001$, $d = 1.26$, respectively, and at below chance levels for privileged information, $t(22) = 4.35$, $p < .001$, $d = .90$, $t(24) = 7.10$, $p < .001$, $d = 1.42$.

To determine whether there were differences in accuracy in classifying conventional and privileged information by whether it was shared or not, responses were recoded with a 1 for correct (conventional information = share, privileged information = not share) and a 0 for incorrect. The same two summary variables were created, Conventional and Privileged information, but this time with the accuracy scores. A paired samples t-test comparing correct responses to conventional and privileged information by age group revealed adults, 5-year-olds and 4-year-olds were not different in accurately identifying conventional and privileged information by sharing, *ps.* $\geq .327$.

Lastly, the means were calculated of sharing responses for each scenario by age and type of information. See Table 1 for these means.

4. Discussion

The results partially supported our hypotheses. As predicted, all groups selected sharing for conventional information more often than privileged information, with accuracy for conventional information improving with each older age group. While adults were less likely to select sharing for privileged information compared to the younger age groups, contrary to our prediction, there were no differences between 5- and 4-year-olds. In addition, the results did not support our prediction that children would be more accurate at classifying conventional information by how it is shared compared to privileged information.

While previous research has found that 4-year-olds think that conventional and privileged information should be shared differently and make some distinction between familiar secrets (e.g., surprises) and non-secrets, they were not able to accurately identify privileged information by how it was shared (Anagnostaki et al., 2010). It appears the use of pictures to illustrate conventional and privileged information revealed that 4-year-olds can accurately classify privileged information by how it is shared and distinguish multiple examples of it from conventional information.

Though this is the first study to find that children as young as 4 have this ability, it does fit with previous research on young children's ability to distinguish between conventional and idiosyncratic information (Andrási et al., 2021; Graham et al., 2006; Henderson & Woodard, 2012; Novack et al., 2014). In addition, it maps well onto 4-year-olds' ability to correctly categorize natural

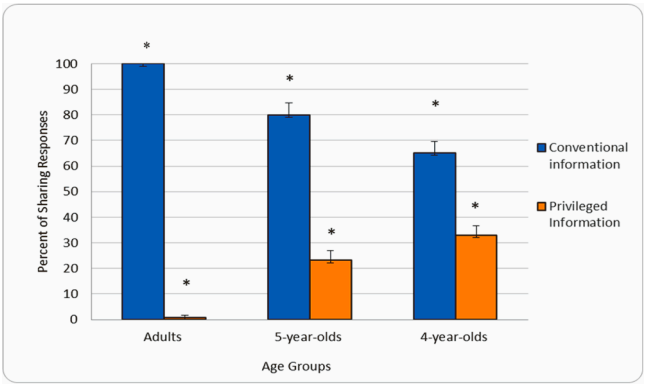

Fig. 1. Percent of share responses by age and information type Note. Asterisks (*) indicate above or below at chance levels ($t = 50\%$).

Table 1
Mean Percent of Sharing Responses by Information Type and Age.

Scenario	Adults	5-year-olds	4-year-olds
Conventional			
Numbers	100.0 (0.0)	72.0 (4.5)	82.6 (3.8)
ABCs	100.0 (0.0)	88.0 (3.3)	73.9 (4.4)
Color (green circle)	100.0 (0.0)	84.0 (3.7)	43.4 (5.0)
Object (cup)	100.0 (0.0)	76.0 (4.3)	60.8 (4.9)
Animal (dog)	100.0 (0.0)	80.0 (4.0)	65.2 (4.8)
Privileged			
Secret	0.0 (0.0)	16.0 (3.7)	21.7 (4.2)
Present (birthday)	0.0 (0.0)	16.0 (3.7)	39.1 (4.9)
Surprise (party)	0.0 (0.0)	32.0 (4.7)	30.4 (4.7)
Hide and seek	4.0 (2.0)	24.0 (4.3)	34.7 (4.8)
Password (to a clubhouse)	0.0 (0.0)	28.0 (4.5)	39.1 (4.9)

Note: Standard deviations are in the parentheses beside the mean percent

kinds, artifacts and human kinds (e.g., gender) and appropriately generalize category membership to novel items in these domains (Coley, 2012; Foster-Hanson & Rhodes, 2019; Gelman & Markman, 1986).

While the examples of both information types should be familiar to young children and had been used in previous research with this same age group, there was some variability in responses among the individual examples of information for the younger age groups. Yet, even with the variability of responses within each information type, the distribution of responses between the information types did not overlap. As is the case with the development of most concepts, experience with how information is constructed and used may influence children's categorization skills and future research should further explore these influences.

5. Study 2

The results from Study 1 demonstrated that children as young as 4 can identify and distinguish between conventional and privileged information as a function of whether that information is shared. The goal of Study 2 was to determine *how* young children and adults categorize types of information.

6. Method

6.1. Participants

There were 68 participants: 22 four-year-olds ($M_{age} = 4;6$, *range* = 3;10 to 5;2, 12 females), 24 six-year-olds ($M_{age} = 6;4$, *range* = 6;1 to 7;1, 13 females) and 22 undergraduate students ($M_{age} = 19;3$, *range* = 18;3 to 20;2, 14 females). The sample size is typical of this age group and research area (for examples see Anagnostaki et al., 2010, Diesendruck et al., 2010, Kim et al., 2014, Liberman & Shaw, 2018, and Loke et al., 2011). Child participants were recruited from area preschools or from the lab's database of families interested in research participation. All were from a predominately middle-class community located in the south-central area of the United States. Participant ethnicity and primary language matched closely to the community's demographics, which are a majority White (79.9.1%), and English-speaking (91.6%; US Census Bureau, 2019). The study was approved by the university IRB and informed consent was obtained from adults and parents/guardians of child participants. Assent was obtained from child participants. The adults were undergraduate students in the same community and participated for research credit. No participants from Study 1 participated in Study 2.

6.2. Materials

Since 4-year-olds accurately identified conventional and privileged information in Study 1, we used the same types of information

Table 2
Study 2 Depicted Information for Target and Test Pictures by Condition.

Condition	Target 1 (Conventional)	Target 2 (Privileged)	Test
Consistent	Cup Numbers	Hide and Seek Present	Dog (does tell) Surprise Party (doesn't tell)
Conflict			
Conventional	Color	Password	Cup (doesn't tell)
	Alphabet	Surprise Party	Color (doesn't tell)
	Numbers	Present	Dog (doesn't tell)
	Dog	Surprise	Alphabet (doesn't tell)
Privileged	Alphabet	Surprise Party	Present (does tell)
	Cup	Hide and Seek	Password (does tell)
	Numbers	Secret	Hide and Seek (does tell)
	Color	Password	Secret (does tell)

and labels in Study. There was a total of 10 trials, and for each trial, there were two target pictures and one test picture. One target picture depicted conventional information and one target picture depicted privileged information. The test picture varied based on one of three conditions. These conditions were based on the type of information in the test picture and whether the function of the information (how it was shared) matched the type of information. The first condition was Consistent, of which there were two trials. For one trial, the test picture depicted conventional information and in the other trial, the test picture depicted privileged information. The second condition was Conflict Conventional, of which there were four trials. The test picture for all four trials depicted conventional information. The third condition was Conflict Privileged, of which there were four trials. The test picture for all four trials depicted privileged information. See Table 2 for depicted information for target and test pictures by condition.

Within each condition, none of the depicted information in the test pictures was the same, and none of the depicted information in the target pictures was the same. However, there were duplicates of the types of information depicted in the target pictures between conditions. In addition, the type of information depicted in the test and target pictures were duplicated but only between trials, not within a single trial. In total, each type of information across all conditions was depicted three times. This methodology is similar to Kemler Nelson et al. (2000), who used the same toys over multiple trials to examine children's categorization strategies (function versus appearance).

A total of 30 pictures comprised the stimuli for Study 2. Though each picture was easily identified as the type of information it was intended to depict, the pictures themselves differed in detail (e.g., green circle, green triangle, green rectangle). Pictures were colored clip art images taken from public domain online sources such as Google Images and were modified in Microsoft Paint. These laminated pictures were approximately 3 in. by 3 in. in size. See Appendix B for the stimuli pictures.

6.3. Procedure

All child participants were tested by a single researcher. Child participants were tested in an empty classroom or a quiet area in their preschool. Adults were tested by multiple researchers in a laboratory on the university campus. The procedure took approximately 15 minutes to complete.

The definition and examples of public and private information the researcher gave to the participants were identical to Study 1, as were the follow up questions to ensure understanding. Researchers had to repeat the definition and questions for ten 4-year-olds and not for any of the 6-year-olds. All participants correctly answered the questions the second time. Immediately after defining the terms, testing began. The researcher first instructed the participant on how the game would be played, and the participant would see the specific information types multiple times during the game, i.e., "Okay, I'm going to show you some different pictures of public and private things and I'm going to ask you which ones are more alike. You will hear about the same kinds of things more than once during the game but that will be okay. You just need to listen very carefully about what I have to say about each of them. Okay? I'm going to

1."See this, this is a birthday present, which is private and cannot be told to anyone."

2. "See this, this is the color green, which is public can be told to anyone."

3. "See this, this is a surprise which is private, but Jane tells this to everyone. So, is it (*researcher points to surprise picture*) like this (*researcher points to green triangle picture*) which is public and can be told, or is it like this (*researcher points to birthday present picture*) which is private and cannot be told."

Fig. 2. Sample Protocol for a Conflict Privileged Trial.

tell you some stories about my friend named Jane." Jane was introduced to the participant for there to be a reason that the information in the test picture was shared or not shared appropriately.

For all trials, the researcher placed two target pictures, one at a time, in front of the participant. One target picture depicted public information and one depicted private information. The researcher identified the information type of each target picture and its function, (e.g., "See this, this is a birthday present which is private and cannot be told to anyone."). The target pictures were placed side by side. After describing the target pictures, the researcher presented the test picture. It was placed below and equidistant from the two target pictures. In the Consistent condition (control), the type of information and how it was shared matched (e.g., "See this, this is a secret which is private, and Jane does not tell this to everyone."). In the Conflict conditions (experimental), the type of information was accurately defined but how it was shared was the opposite of normative sharing rules. In the Conflict Conventional condition, the test pictures depicted conventional information that was not shared (e.g., "See this, this is the color green, which is public, but Jane does not tell this to everyone."). In the Conflict Privileged condition, the test pictures depicted privileged information that was shared (e.g., "See this, this is a secret which is private, but Jane told this to everyone)". The test question was then asked, which was whether the test picture was like either of the target pictures. In the Consistent trials and both types of Conflict trials, the conjunction (either 'and' or 'but') joining the information type and its function was emphasized by the researcher. See Fig. 2 for an example of the protocol for a Conflict Privileged trial.

Consistent trials were presented to ensure participants understood the procedure and were attending to the information given in each trial. In addition, there were two memory check questions for four of the eight Conflict trials. These were the same four questions for both orders presented to participants. The memory questions were asked after the participant responded to the test question. The first memory test question was whether the information in the test picture was public or private, and the second question was whether 'Jane' told or did not tell it to everyone. The procedure was the same for the adults. For instructions, though, the researcher reiterated the study was designed for young children and wanted to know in general which types of information are similar to each other.

The following components were counterbalanced across trials for each participant: presentation of the target pictures by type of information (public or private) and which side it was presented (left or right), wording of the category membership and function of the test picture (e.g., private but Jane told everyone/Jane told everyone but it is private) and order of the function and category membership terms in the test question (e.g., is it like this which is public and told/is it like this which is told and public). There were two orders, the second order being the reverse of the first order of questions. Half the participants were given the first order and half the second order.

7. Results

Responses that referred to category membership (label: public or private information) were coded as 1 and function responses (told or not told) were coded as 0. The following summary variables were created, Consistent Trials, Conflict Conventional, and Conflict Privileged, by summing up the responses for each trial type and then dividing by the number of questions. These were then converted to percentages and served as the dependent variable. Since the Consistent Trials were meant to serve as a check that the procedure was understood by participants, a one-sample t-test was conducted on these trials only. One hundred percent of adults matched the label type of the test question to the same information type in the target, 93% of 6-year-olds, $t(23) = 12.68$, $p < .001$, $d = 2.58$%, and 65.9% of 4-year-olds, $t(21) = 2.30$, $p = .031$, $d = .49$.

There was a total of eight memory check questions (two asked after each of the four trials). Memory check questions were coded with a 1 for a correct response and 0 for an incorrect response. The mean percent of accurate responses to the memory test questions was calculated by summing up participants' scores for all eight questions and dividing by the number of questions. A one-sample t-test (test value = 50%) compared the proportion of correct responses from participants in each age group to chance. This analysis revealed that 4-year-olds answered the memory check questions correctly at above chance levels, ($M = 67$%), $t(21) = 3.13$, $p = .005$, $d = .66$, as did 6-year-olds ($M = 78$%), $t(23) = 6.39$, $p < .01$, $d = 1.30$, and adults ($M = 94$%) $t(21) = 20.45$, $p < .001$, $d = 4.36$. While 4-year-olds correctly answered the memory questions at above chance levels, they were less accurate than the other age groups. Therefore, for the four trials with the memory check questions, we calculated the means of category membership responses for those 4-year-olds who correctly answered both memory questions and the means for those 4-year-olds who incorrectly answered one or both of the memory questions. To examine whether category membership responses for these groups differed, we conducted an independent t-test for each trial. There were no significant differences between responses for Trial 1, $t(20) = .41$, $p = .682$, $d = .17$, Trial 2, $t(20) = .72$, $p = .476$, $d = .33$, Trial 3, $t(20) = .44$, $p = .658$, $d = .19$, or Trial 4, $t(20) = .04$, $p = .965$, $d = .01$. These results increase confidence that participants' responses were based on accurately answering the test question and were not a function of memory performance.

A 3 × 2 (Age [4-, 6- year-olds, adults] x Trial Type [conflict conventional, conflict privileged]) mixed ANOVA revealed a main effect of Age, $F(1,67) = 3.28$, $p = .044$, $\eta_p^2 = .09$. There was no main effect of Information Type or an interaction, $ps \geq .096$. A Tukey's post hoc analysis was conducted on the main effect of Age. It revealed that 4-year-olds were more likely to categorize information by its label ($M = 63.6$%) compared to 6-year-olds ($M = 41.7$%). To further examine age differences in category membership responses by type of information (trial type), a one-way ANOVA was conducted. It revealed differences by age for conventional information, $F(2,67) = 4.53$, $p = .014$, $\eta^2 = .122$, but no differences for privileged information, $p = .296$. A Tukey's post hoc analysis found adults ($M = 63.3$%) and 4-year-olds ($M = 67.0$%) were more likely to use category membership (or its label) for conventional information than 6-year-olds ($M = 39.6$%). We conducted a paired sample t-test to compare responses by trial type for each age group as well. Adults were trending towards significance with more category membership (label) responses for Conflict Conventional than for Conflict Privileged, $t(21) = 2.01$, $p = .057$, $d = .42$. For 6- and 4-year-olds, there were no differences in category membership responses between trial types, $ps \geq .106$. See Fig. 3 for category membership responses by trial type and age.

Participant category membership responses were also compared to chance (test value = 50%). Adults and 6-year-olds were at chance for responses to Conflict Conventional and Privileged trials, $ps \geq .09$, $ps \geq .108$, respectively. Lastly, 4 -year-olds were at above chance for Conflict Conventional, $t(21) = 2.41$, $p = .025$, $d = .51$, and at chance for Conflict Privileged, $p = .206$.

To examine children's and adults' responses across individual items, means were calculated for each of the conflict trials by age. See Table 3 for these means.

Except for the 4-year-olds' category membership (label) responses to the Conflict Conventional trials, all other responses were at chance for the conflict trials. To determine if this pattern of results represented participants who were individually consistent, but in different ways (e.g., half with all function responses and half with all category membership responses) or if most participants were truly responding randomly by trial type (e.g., selecting category membership for one question and function for the next), we examined the distribution of category membership responses for the Conflict Conventional and Privileged trials. If participants responded randomly then their pattern of responses should not differ from the expected binomial distribution. The patterns of responses were examined separately for Conflict Conventional and Privileged trials, each of which had 4 trials. This data is shown in Table 4. Four-year-olds' patterns of responses were not significantly different from the binomial distribution on Conflict Conventional trials, χ^2 (4) = 7.24, $p > .10$, nor for Conflict Privileged, χ^2 (4) = 8.39, $p > .05$. Six-year-olds' pattern of responses did differ from the binomial distribution on the Conflict Conventional trials, χ^2 (4) = 14.04, $p = .01$, but did not differ for the Conflict Privileged trials, χ^2 (4) = 6.58, $p = .1$. Adults' pattern of responses did differ from the binomial distribution on the Conflict Conventional trials, χ^2 (4) = 13.36, $p = .01$, but did not differ for Conflict Privileged trials, χ^2 (4) = 4.56, $p = .1$. These distributions revealed that while 6-year-olds tended to treat the items based on how they were shared, adults treated conventional information as conventional regardless of its use.

8. Discussion

We predicted that older age groups would categorize information by its membership (label) more so than younger age groups and that there would be more category membership responses for conventional information as compared to privileged, which the results partially supported. Adults and 4-year-olds identified conventional information by its category membership more so than 6-year-olds, while there were no differences among the age groups in identifying privileged information. Adults trended towards using category membership to identify conventional information more so than privileged information, however, 4- and 6-year-olds did not differ in how they identified both information types. In addition, no age group differed from binomial expectations for privileged information. However, 6-year-olds and adults differed from chance when they categorized conventional information. Adults were more likely to categorize the depicted conventional information by its category membership across all trials, while 6-year-olds were more likely to categorize the depicted conventional information by its function (sharing) across all trials. While the distribution of responses of the 4-year-olds for privileged information did not differ from chance, they did categorize conventional information by its category membership at above chance levels.

Responses to individual items by age and information type revealed variability across items. It is uncertain if this variability was a result of familiarity (or lack thereof) or the specific type of information. For example, does being unfamiliar with a type of information, like a password, shift one's focus to how it is being shared rather than the type of information it is? Yet adults, whom we assume were familiar with all the privileged information examples, gave more category membership responses for a secret compared to a password. These results suggest that an investigation into the role of familiarity and experience with different examples of information will be an important next step to better understand how children and adults are categorizing information.

9. General discussion

With decades of research on what, when, and how children categorize, one domain that has not been as fully investigated is when and how children categorize information. The goal of the current research was to examine whether young children could categorize conventional and privileged information, and which properties, either category membership (label) or function (shared or not shared), were used to identify them. There are numerous potential social and cognitive consequences for not appropriately identifying or

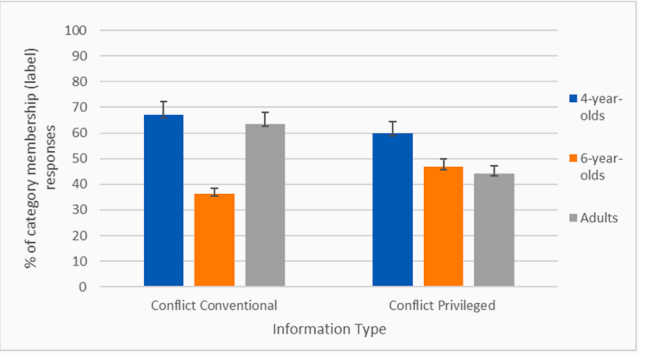

Fig. 3. Category Membership Responses by Trial Type and Age.

Table 3
Mean Percent of Category Membership Responses for Conflict Trials by Age.

Scenario	Adults	5-year-olds	4-year-olds
Conflict Conventional			
Object (cup, not shared)	54.5 (5.0)	37.5 (4.9)	68.1 (4.7)
Color (green, not shared)	68.1 (4.7)	37.5 (4.9)	68.1 (4.7)
Animal (dog, not shared)	72.7 (4.5)	33.3 (4.8)	77.2 (4.2)
Alphabet (not shared)	59.0 (5.0)	37.5 (4.9)	54.5 (5.0)
Conflict Privileged			
Present (shared)	50.00 (5.1)	41.6 (5.0)	59.9 (5.0)
Password (shared)	31.8 (4.7)	41.6 (5.0)	45.4 (5.0)
Hide and Seek (shared)	31.8 (4.7))	45.8 (5.0)	77.2 (4.2)
Secret (shared)	63.6 (4.9)	58.3 (5.0)	59.0 (5.0)

Note: Standard deviations are in the parentheses beside the mean percent

Table 4
Number of Category Membership Responses per Trial by Age and Trial Type.

	Conflict Conventional					Conflict Privileged				
Trial No	0	1	2	3	4	0	1	2	3	4
4-year-olds	2	2	5	5	8	4	2	3	7	6
6-year-olds	10	4	4	1	5	6	4	6	3	5
Adults	4	3	2	3	10	6	3	5	6	2

disseminating information, especially considering the vast amount of information, both accurate and deceptive, that is widely available and accessible to all. Therefore, it is critical to understand those characteristics that children (and adults) use to identify information and how these findings fit into the larger theoretical framework of how children learn about their world (e.g., Gelman, 2003). We believe the results of the current studies provide some insight into how children and adults categorize conventional and privileged information and, importantly, provide a strong foundation for future research questions.

While differentiating between conventional and idiosyncratic information starts during infancy (Diesendruck et al., 2015; Graham et al., 2006; Henderson & Woodard, 2012; Novack et al., 2014), to date, the existing research supports that it is not until around 5-years of age that children can differentiate among types of privileged information, and between secrets and non-secrets. The current findings provide some of the first evidence that we are aware of that demonstrates that 4-year-olds can distinguish between conventional and privileged information by attending to whether that information is shared. Not only did 4-year-olds distinguish conventional from privileged information, but they also accurately identified the information types and did so for a broader range of information examples than in previous research. These findings support the importance of using multiple methodologies when building evidence for young children's categorization skills in new domains. Such results are consistent with prior research that has shown that 4-year-olds demonstrate categorization skills in other domains, such as natural kinds and artifacts (see Gelman & Noles, 2011; Keil, 1992; Rhodes, 2013; Rhodes et al., 2014).

While each older age group was more accurate than younger age groups at identifying conventional information by how it is shared, adults were more accurate at identifying privileged information compared to both younger age groups, with no differences between the younger age groups. These results suggest that 4- and 5-year-olds are still building strategies to identify privileged information and may undergo a shift around 6-years of age, when they become more adept at keeping secrets (Anagnostaki et al., 2010; Liberman, 2020; Liberman & Shaw, 2018). In addition, both 4- and 5-year-olds were equally accurate at identifying conventional and privileged information. It supports that 4-year-olds are not prioritizing information as conventional but are equally able to determine what is conventional and not conventional.

These results also support the conclusion that children can identify privileged information before they can properly use this type of information, that is, not share it freely with others. A preponderance of the literature on children's secret sharing has found that 3- and 4-year-olds will share secrets and privileged information more indiscriminately compared to older children (Bottoms et al., 2002; Peskin & Ardino, 2003; Pipe & Wilson, 1994; Watson & Valtin, 1997). In many cases, it is not until age 6 that children begin to withhold secrets from others. Young children's ability to identify a particular concept before being able to appropriately use it is not an uncommon phenomenon in development, though. Peskin and Ardino (2003) found that 3-year-olds could correctly explain the rules of hide and seek to a third party but could not play the game by those same rules. In addition, research on selective trust has found that 3-year-olds are able to identify accurate informants versus inaccurate ones even though they do not regularly use this knowledge to choose whom they would like to learn from in subsequent interactions (Koenig & Harris, 2005). It appears that experience plays a greater role in being able to appropriately use privileged information.

To our knowledge, Study 2 was the first to examine *how* children and adults categorize conventional and privileged information: by its category membership (label) or by its function (whether it is shared). We tested both conventional and privileged information to determine whether there was a single categorization strategy for two distinct types of information or if strategies varied for different information types. We predicted that older age groups would categorize information by its membership more frequently than younger age groups, and younger age groups would categorize conventional information by its membership more so than privileged

information. There was partial support for these predictions. Four-year-olds categorized conventional information by its membership, and adults did so as well, at least more often than was expected by chance. Unexpectedly, 6-year-olds categorized conventional by how it is shared more often than was expected by chance. There was no age difference in categorization strategies for privileged information. Comparing categorization strategies between conventional and privileged information, 4- and 6-year-olds did not differ in their responses to conventional and privileged information, but adults trended towards using category membership to categorize conventional information more often than privileged information.

An intriguing developmental pattern emerged in terms of how *conventional* information was categorized, with 4-year-olds using category membership, 6-year-olds using how the information was shared, and adults reverting to using category membership. It may be that young children's predisposition towards conventional information makes them highly attuned to its properties, and a specific case of not sharing was not sufficient to change these children's judgments about information type. As indicated by the research on secrets, by the time children turn 6-years-old, they have more experience with and are differentially sharing privileged information (Anagnostaki et al., 2010; Anagnostaki et al., 2013; Bedrov et al., 2020; Liberman, 2020; Liberman & Shaw, 2018; Watson & Valtin, 1997). Furthermore, children in the U.S. in this age range are transitioning to first grade, which is a more structured learning setting in which a pedagogical teacher-student relationship is entrenched. Direct instruction may include the normative teacher-student interaction of asking questions and sharing answers, and experiencing negative consequences for not sharing the answers. Simultaneously, there is more awareness of the social costs of tattling, which is reporting that a peer has done something wrong to a teacher and/or other peers. These social costs may include being ostracized and/or made fun of by peers, and for less serious rule infractions, admonishment by teachers. The shift to more formal educational practices from preschool might heighten 6-year-olds' awareness of rules of sharing information, which may explain their pattern of responses to conventional information. However, future research will need to examine those underlying mechanisms and reasons for categorizing conventional information across an expanded range of ages.

While there was an interesting developmental pattern for categorizing conventional information, there was no consistent pattern of responses for privileged information and no differences between the age groups. It appears that 4- and 6-year-olds and adults did not categorize privileged information solely by its category membership or function, but rather some combination of both. The lack of a single strategy for categorizing privileged information may underlie the more person-specific nature of privileged information. Indeed, a central property of privileged information is that should not be shared with others (Anagnostaki, Wright, & Bourchier-Sutton, 2010; Anagnostaki, Wright, & Papathanasiou, 2013; Kim, Harris, & Warneken, 2014; Liberman, 2020; Vangelisti, 1994; Vangelisti & Caughlin, 1997; Watson & Valtin, 1997). However, categorization strategies tend to be stable across domains, either by sharing or category membership, so it will be critical to continue to empirically investigate what criteria is used to identify privileged information.

10. Limitations and future directions

In Study 1, 4- and 5-year-olds distinguished between conventional and privileged information by how it was shared, indicating that children had a separate category for privileged information. However, an alternative explanation of this finding could be that children were identifying privileged information simply as 'not conventional' information rather than as privileged information as its own distinct category with its own unique set of properties. 'Not conventional' information could be identified by several properties, including less familiarity with them. Future research should examine this issue by asking children to categorize information using properties other than shareability, such as its generalizability or whether it is known by other people. A critical next step will be to examine how children categorize novel items within each information type. This will provide evidence that children are not simply aping what has been told to them (e.g., 'don't tell mom what I got for her birthday') but are recognizing the properties associated with these types of information.

Based on the apparent ease with which adults can distinguish privileged information from conventional information (Anagnostaki et al., 2010; Behrend & Girgis, 2024) and the efficiency of human categorization and reasoning processes, one assumesthere is a developmental trend that culminates in adults categorizing privileged information by some defined set of properties, resulting in a stable strategy. Neither the developmental trend nor the stable categorization strategies were found for privileged information. Although pictures were used to represent the information types in Study 2, the stimulus pictures were defined verbally in terms of information type and function. One possible explanation is that the wording may have hampered both children's and adults' understanding of the task and became too demanding on working memory, or the design itself was confusing to participants. While responses to the memory check questions for all age groups were at above chance levels, the 4-year-olds were less likely than the older age groups to correctly answer them. Yet, category membership responses from 4-year-olds who did and did not answer the memory questions correctly did not differ. Memory issues also cannot account for why adults did not use a stable categorization strategy for privileged information.

It may be due to the more person-specific nature of privileged information. Indeed, a central property of privileged information is that should not be shared with others (Anagnostaki, Wright, & Bourchier-Sutton, 2010; Anagnostaki, Wright, & Papathanasiou, 2013; Kim, Harris, & Warneken, 2014; Liberman, 2020; Vangelisti, 1994; Vangelisti & Caughlin, 1997; Watson & Valtin, 1997). Therefore, 'Jane' sharing a password may make it more difficult to determine whether it is still privileged information. Yet, this does not explain that older age groups were not classifying privileged information by how it was shared either. A possible explanation for the pattern of responses could be familiarity, or lack thereof, for individual examples of information. The previous research on secrets supports that these are developmentally appropriate for the ages of the participants, however, we did not specifically test for familiarity. It is a possible explanation for higher category membership responses for secrets as compared to passwords. As this was the first study of its

kind to investigate the criteria by which information is categorized, future research should include explanations to better understand the reasoning behind a decision, and further explore the role of familiarity and memory on these decisions. A critical part of future research should be on providing a complete set of properties for privileged information, similar to how previous research for conventional information (for example, see Lewis, 1969).

The generalizability of these results could be limited by the demographics of this sample. The mostly White and middle-class child and adult participants are not representative of the very diverse world in which we live (indeed they are the minority). While the domains of conventional and privileged information are expected to be known across cultures, nuances in this distinction likely will vary based on geography and cultural traditions. Moreover, there are likely differences in the age of exposure to privileged information. It will be necessary for future research to include a more diverse range of participants before we can generalize with confidence that populations as a whole are categorizing information in this manner.

11. Conclusions

With the advent of technology and easy access to both retrieve and disseminate information, understanding how children categorize information types becomes more important. We provide new evidence that children as young as 4-years-old can accurately identify and distinguish between conventional and privileged information. In addition, we examined whether children and adults categorize information by the *kind* of information it is (as identified by its label), by its function (whether it is shared), or by multiple strategies. While this is a first examination into children's information categorization strategies, it seems there is a nonlinear pattern of categorizing conventional information, with 4-year-olds and adults using category membership more than 6-year-olds, and no pattern for privileged information. These findings provide a strong foundation for multiple new avenues of research, especially in terms of better understanding the developmental pattern and underlying mechanisms of how conventional and privileged information is categorized.

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Declaration of Competing Interest

None.

CRediT authorship contribution statement

Girgis Helana: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Behrend Douglas A:** Conceptualization, Formal analysis, Methodology, Project administration, Resources, Supervision, Writing – review & editing.

Data availability

Data will be made available on request.

Appendix A

Category label pictures

Public

Private

Conventional information

1 2 3
4 5 6

These are numbers up to six.

These are the ABCs.

The name of this is a dog.

The name of this is a cup.

This is the color green.

Privileged information

This is a password to a clubhouse.

This is a surprise party.

This is a secret.

This is a birthday present.

This is where someone is hiding in hide and seek.

Appendix B

Conventional Information

Numbers

Alphabet Letters

Dog

Color

Cup

Privileged Information

Secret

Birthday present

Hide and seek

Surprise party

Password to clubhouse

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