Cognition 275 (2026) 106610

Contents lists available at ScienceDirect

Cognition

journal homepage: www.elsevier.com/locate/cognit

A folk taxonomy of magic

Gustav Kuhn [a,*], Cyril Thomas [b,c], Thomas L. Griffiths [d]

[a] School of Psychology, University of Plymouth, UK
[b] Department of Psychology, Université Marie et Louis Pasteur, France
[c] Institut Universitaire de France, France
[d] Departments of Psychology and Computer Science, Princeton University, USA

ARTICLE INFO

Keywords:
Causal reasoning
Taxonomy
Intuitive physics
Belief violation
Similarity judgments
Folk categorization

ABSTRACT

Magic tricks provide a uniquely powerful window onto the boundaries of what people consider possible, and the ways in which those boundaries can be challenged. Although there exists an effectively infinite variety of magic tricks, relatively little is known about how different magical effects relate to one another at a psychological level. Previous attempts to classify magic have largely relied on the judgments of a small number of expert magicians, rather than capturing people's intuitive understanding of magical phenomena. Here, we introduce a new multi-dimensional taxonomy of magic that treats the observable effect (e.g., an object vanishing) and the attributed cause (e.g., a magic wand) as independent dimensions. This framework allows a wide range of magic tricks to be systematically described and captures the vast majority of known magical effects. We evaluated the psychological validity of this taxonomy by asking participants to judge the perceived similarity between magic tricks drawn from each category. These similarity judgments were used to construct a dendrogram, revealing a hierarchical structure that reflects how people cognitively organize magical effects. The results corroborate several key distinctions traditionally made by magicians, such as the separation between mental and physical effects, while also revealing more subtle patterns in the perception of magic that have not previously been documented. Together, these findings provide a psychologically grounded framework for understanding how people categorize and experience magical impossibilities.

1. Introduction

Magic is an artform that transcends everyday experience (Kuhn, 2019; Leddington, 2016). There are thousands of different magic tricks, but they all have one thing in common: they allow the audience to experience things they believe to be impossible (Parris, Kuhn, Mizon, Benattayallah, & Hodgson, 2009). Magic is thus a uniquely valuable source of information about the boundaries of what people consider possible and the ways in which those boundaries can be pushed. For example, people have strong beliefs about which kinds of magic tricks are interesting (Griffiths, 2015) and which seem to require more power (McCoy & Ullman, 2019), with tricks that violate more deep-seated principles of intuitive physics being more impressive (Lewry, Curtis, Vasilyeva, Xu, & Griffiths, 2021). Since beliefs about magic cannot, by definition, be based on direct experience, they offer a novel source of information about the causal forces that people have inferred to explain their actual experiences. In this paper, we reveal the structure of these inferred forces by developing a folk taxonomy of magic tricks.

There has been much interest in the psychological mechanisms that underpin our experience of magic (Kuhn, Amlani, & Rensink, 2008; Macknik et al., 2008; Rensink & Kuhn, 2015b; Thomas, Didierjean, Maquestiaux, & Gygax, 2015). A systematic study of magic requires understanding the relationship between these different tricks (Rensink & Kuhn, 2015a). For example, taxonomies of misdirection (Kuhn, Caffaratti, Teszka, & Rensink, 2014) and forcing (Pailhès, Rensink, & Kuhn, 2020) have helped to identify the psychological mechanisms that underpin the creation of the magical effects. However, comparatively little attention has been devoted to the systematic investigation of the different types of effects that magic can elicit. Developing a taxonomy of magical effects is an essential step toward understanding people's intuition about boundaries of possibility and identifying the psychological features that influence people's perception of magic.

Magicians and theorists of magic have developed informal taxonomies of magic tricks, but none of these taxonomies has been universally accepted (Gunasekara, 2017). We took a different approach to understanding the organization of magic tricks, collecting laypeople's

* Corresponding author.
E-mail address: gustav.kuhn@plymouth.ac.uk (G. Kuhn).

https://doi.org/10.1016/j.cognition.2026.106610
Received 19 January 2026; Received in revised form 2 June 2026; Accepted 4 June 2026
Available online 13 June 2026

judgments of the similarity of different magical effects and then using hierarchical clustering to infer a taxonomy from these judgments. This approach is analogous to that taken in studies of folk biology, where taxonomies of flora and fauna are constructed based on judgments provided by members of a community (Medin & Atran, 1999). We complement this taxonomy of magical effects with a similar analysis of how people perceive the similarity between different magical causes.

1.1. Background: taxonomies of magic

There are numerous informal taxonomies of magic tricks (Gunasekara, 2017), and it is beyond the scope of this paper to review them all. Magicians often describe tricks in terms of the props (card magic, coin magic, silk magic) or the context in which they are performed (e.g. close-up vs. stage). Back in 1878 Robert-Houdin (1878 translated and edited by Prof. Hoffman) suggested that the art of conjuring can be divided into six branches, which included categories such as tricks that are based on dexterity, experiments in natural science, or mental conjuring. Kelley (1980) proposed a more academic taxonomy that focuses on the type of events that may appear magical, or supernatural, distinguishing between tricks that violate cause-effect sequences (e.g. fire produces something that is alive rather than dead) and violations in entity properties (e.g. an object disappears). The most prominent taxonomies tend to focus on basic effects. For example, Blackstone, Reynolds, and Reynolds (1985) proposed a taxonomy which breaks down all known tricks into a small number of basic effects that are independent of the objects being used, such as productions, vanishes, restorations etc. Their taxonomy also included non-physical effects, such as mentalism (i.e., a genre in which the magician seems to exhibit extraordinary mental or parapsychological abilities) or escapes (see also Fitzkee, 1944).

These taxonomies have had relatively limited impact on the world of magic and science. One of the major issues is that the categories are rarely mutually exclusive. For example, a trick in which the magician identifies the identity of a selected card may be described either as a card trick or as a mentalism effect. Moreover, most of the taxonomies are comprised of lists of categories of effects, which prevents them from highlighting relationship between those categories and limits their value.

1.2. Identifying a folk taxonomy

Our goal was to identify a taxonomy of magic tricks that focuses on how the spectator experiences the magic trick. Following previous efforts, the taxonomy should allow us to capture all magic effects and organize them in a meaningful and consistent way. It needs to be meaningful in that within each category, tricks should elicit similar experiences or/and be underpinned by similar cognitive mechanisms. And it should have a hierarchical structure that allows us to specify the direct relationship between the tricks, and when possible, attempts to link them to common psychological processes.

To identify such a taxonomy, we started by creating descriptions of a set of magical effects. These descriptions are entirely independent of how the effect is accomplished, and instead focus on the outcome that the magician intends for their audience to perceive. For example, rather than specifying the method used to vanish a coin (e.g., false transfer, magical box etc.) the description focuses on the result – that the coin vanished.

Magicians typically perform their tricks within a broader narrative framework, often attributing a magical cause to the observed effect. In some cases, this attribution is explicit. For instance, Robert-Houdin performed his famous levitation while claiming that “ether” could make bodies rise. In other cases, the attribution of magical causation is more implicit—for example, when a magician performs a ritualistic gesture or wave of the hand before making a coin disappear. While such variations in the purported cause may appear trivial, they can fundamentally alter the perceived nature of the effect. In tricks where the magician appears to extract information from a spectator, for example, the experience differs markedly depending on whether the magician claims to be reading the spectator's mind or merely interpreting subtle psychological cues. In these two performances, the core belief violation is the same (information is extracted), but the causal attributions to the effect are different. This separation has important implications for how people experience a magic trick (Subbotsky, 2001), and it allows us to focus first on the belief violation that has occurred and then on the intended cause.

Causal attributions for inexplicable events vary substantially, and these differences offer insight into individuals' broader worldviews and the cognitive mechanisms that support them (Brugger & Mohr, 2008). For example, children exhibit marked developmental changes in how they explain magic tricks: over time, they shift from endorsing explicitly magical explanations to those that reflect a more scientific conception of the world, although many such explanations remain inaccurate (Olson, Demacheva, & Raz, 2015; Subbotsky, 2001). Understanding these shifts in causal attribution has important implications for theories of cognitive and conceptual development. Among adults, substantial research has examined the causes people ascribe to anomalous events (Benassi, Singer, & Reynolds, 1980; Mohr, Koutrakis, & Kuhn, 2015). Believers in the paranormal, for instance, are more likely than sceptics to attribute phenomena such as apparent mind reading to spiritual or supernatural forces (Kuhn, Ortega, Simmons, Thomas, & Mohr, 2023). These paranormal attributions have been linked to specific cognitive biases and may reflect more fundamental cognitive processes (Brugger & Mohr, 2008). Recent work has further demonstrated that individual differences in personality and thinking styles shape the extent to which adults interpret magic tricks as genuinely supernatural (Silvia, Crasson, Greengross, & Kuhn, 2025). Despite these advances, attributions to “magical causes” remain conceptualised in broad terms, and relatively little is known about the structure of the different causal categories people apply when interpreting magic tricks. Developing a taxonomy of causal attributions in the context of magic would represent a significant step toward clarifying the nuanced relationships among these explanatory frameworks.

Our descriptions are also independent of the objects that are involved in tricks. We fully acknowledge that the nature of the object will influence how a particular magic trick will be perceived. Previous research has identified systematic differences in both the level of interest elicited by different types of magical transformations (Griffiths, 2015; Shtulman & Morgan, 2017) and in people's intuitions about the effort such transformations would require (McCoy & Ullman, 2019). For instance, individuals tend to judge the levitation of heavy objects as requiring greater magical power than the levitation of light objects (Shtulman & Morgan, 2017). Moreover, the perceived direction of a transformation can also influence its appeal. Griffiths (2015) demonstrated that people find transformations that ascend an ontological hierarchy—such as a vase turning into a rose—more interesting than those that descend it (e.g., a rose turning into a vase). While we acknowledge that the specific nature of the object influences how a trick is experienced, our present focus is on the underlying causal forces and their psychological effects. Consideration of object identity as an additional dimension will be introduced in future work.

All previous magic taxonomies have been based on the opinions of a small number of experts, rather than trying to capture people's intuitive understanding of magic. We aimed to evaluate our taxonomy by asking participants to judge the similarities between magic tricks from each of the categories. Participants should rate tricks that fall within-category magic tricks as more similar than inter-category magic tricks. Similarity ratings will also allow us to quantify the relationships between the categories.

2. Experiment 1 – Identifying folk taxonomy of magical effects

2.1. Method

2.1.1. Participants

We recruited 302 participants from Prolific and paid them at a rate of 12 USD/h, following Princeton University IRB protocol number 10895. Of the 302 participants, 179 self-identified as a man, 109 as a woman, 1 as other, and 13 did not specify. Reported age in years had a mean of 41.0 and standard deviation of 12.4.

2.1.2. Material and procedure

We started by developing a list intended to capture as many magic effects as possible (see Appendix A). This initial list allowed us to generate a set of magic trick descriptions that captured all different types of magic tricks that are typically performed. The selection of magic tricks was informed by previous taxonomies of magic effects to ensure that the proposed taxonomy could accommodate the full range of possible tricks. We also consulted experienced magicians and encouraged them to identify tricks that were not currently captured by the existing categories. Whenever such examples were identified, they were incorporated into the list. To ensure that effects were evaluated independently of the specific object involved, each effect was presented using the term "an object" without specifying its nature. For example: *"The magician makes an object appear."* We took the 47 effects in this list and constructed a similarity matrix from people's ratings of the similarity of each pair of effects.

Participants were given the following instructions:

> Imagine you are working as an assistant to a magician. The magician is evaluating tricks for his act, and wants to know which tricks are similar to one another. For each pair of tricks, rate on a scale from 0 to 10 how similar the two tricks are to one another, where 0 means "Not at all similar" and 10 means "Extremely similar".

Since there are 1081 such pairs, it was impractical for individual participants to rate all pairs. Each participant rated up to 80 random pairs of stimuli, and recruitment proceeded until each pair received an average of 20 judgments per pair.

2.2. Results

Similarity ratings were divided by 10 to yield normalized similarities that lie between 0 and 1, with 1 indicating perfect similarity and 0 indicating perfect dissimilarity. To ensure that this sample was sufficient we computed inter-rater reliability (IRR) using a split-half method with 1000 random splits of the data, using the Spearman-Brown correction. We found that the IRR was indeed high ($r(1079) = 0.94$).

To extract a taxonomy from these similarity data we applied hierarchical agglomerative clustering using the "average" linkage function (Sokal & Michener, 1958).[1] This algorithm proceeds by clustering the most similar pair, then continuing to cluster pairs in order of similarity where the similarity between two clusters is the average of the similarity between their members. The result is a taxonomic structure, as illustrated in the dendrogram shown in Fig. 1. To assess how well this taxonomy captured the human similarity data, we calculated the cophenetic correlation between the distances between pairs derived from the dendrogram and the negative similarity judgments (Sokal & Rohlf, 1962). We found a cophenetic correlation of $r(1079) = 0.87$, while datasets that do not display hierarchical structure typically have correlations below 0.5 (Rohlf & Fisher, 1968).

[1] Other linkage functions produced qualitatively similar results so we selected the average linkage to maximize the stability of the solution.

2.2.1. Interpretation of the taxonomy

The dendrogram illustrating the folk taxonomy can be interpreted by considering the splits it makes from top to bottom, with splits that have a longer branch length reflecting a more significant distinction. The first major distinction concerns whether effects involve objects. Object-based effects involve instances where an object undergoes a transformation that violate our understanding of the physical world. For example, a rabbit appears from a hat, or the magician levitates across the stage. Non-object-based effects include all tricks that do not involve violations in physical object properties. For example, a magician predicts a future event or extracts information from a person's thoughts. Non-object-based effects can involve physical objects, but the objects themselves do not violate our understanding of the physical world. For example, the magician may use cards to demonstrate their mind-reading abilities.

This distinction between object-based and non-object-based effects is reflected in several existing taxonomies of magic (Lamont & Wiseman, 1999). For instance, mentalism refers to a genre in which the magician appears to demonstrate extraordinary mental or parapsychological abilities. Practitioners and audiences alike often regard mentalism as distinct from traditional forms of magic, and most mentalism effects fall within the non-object-based category. We propose that this categorical distinction also has a foundation in cognitive science. In object-based effects, spectators directly perceive an apparent physical violation—an anomaly at the level of perceptual inference—whereas in non-object-based effects, the violation must be inferred through higher-level cognitive processes. This division aligns with prominent developmental theories of knowledge acquisition. Cognitive systems responsible for representing knowledge about physical objects emerge during early infancy and precede the development of more abstract conceptual systems that underlie reasoning about non-object-based effects (Spelke & Kinzler, 2007).

2.2.2. Non-object based effects

The dendrograms reveal three primary categories of non-object-based effects.

2.2.2.1. Influencing and extracting information. This category encompasses effects that involve the extraction of information—whether concerning the past, present, or future. It also includes effects in which thoughts are influenced or memories are altered, such as instances where spectators are unable to recall specific information. These effects challenge the privacy and impermeability of thought, which are core aspects of theory of mind (i.e., the ability to attribute mental states to oneself and to others) (Premack & Woodruff, 1978).

2.2.2.2. Influences cognitive and physical abilities. This category includes a range of phenomena involving the alteration of a person's perceptual, cognitive, or motor capacities—for example, rendering someone temporarily unable to see or read, or modulating their apparent strength. It also extends to the influence of other behaviours. These effects interfere with the sense of self-agency (i.e., the subjective experience of controlling one's own actions) (Russell, 2013).

It is worth noting that these first two categories rely on influence and therefore involve an interaction between the magician's and the spectator's minds. These forms of influence appear to share closely related underlying failures. For instance, a study by Zalla, Miele, Leboyer, and Metcalfe (2015) showed that difficulties in using internal diagnostic cues to monitor one's own agency are associated with impairments in theory of mind tasks. Indeed, self-agency seems to be fundamental for establishing boundaries between self and others. Difficulties in maintaining such boundaries may have broad consequences, including impairments in understanding others' perspectives and in recognizing that these perspectives may differ from one's own.

2.2.2.3. Demonstrate cognitive and physical supernatural abilities. This

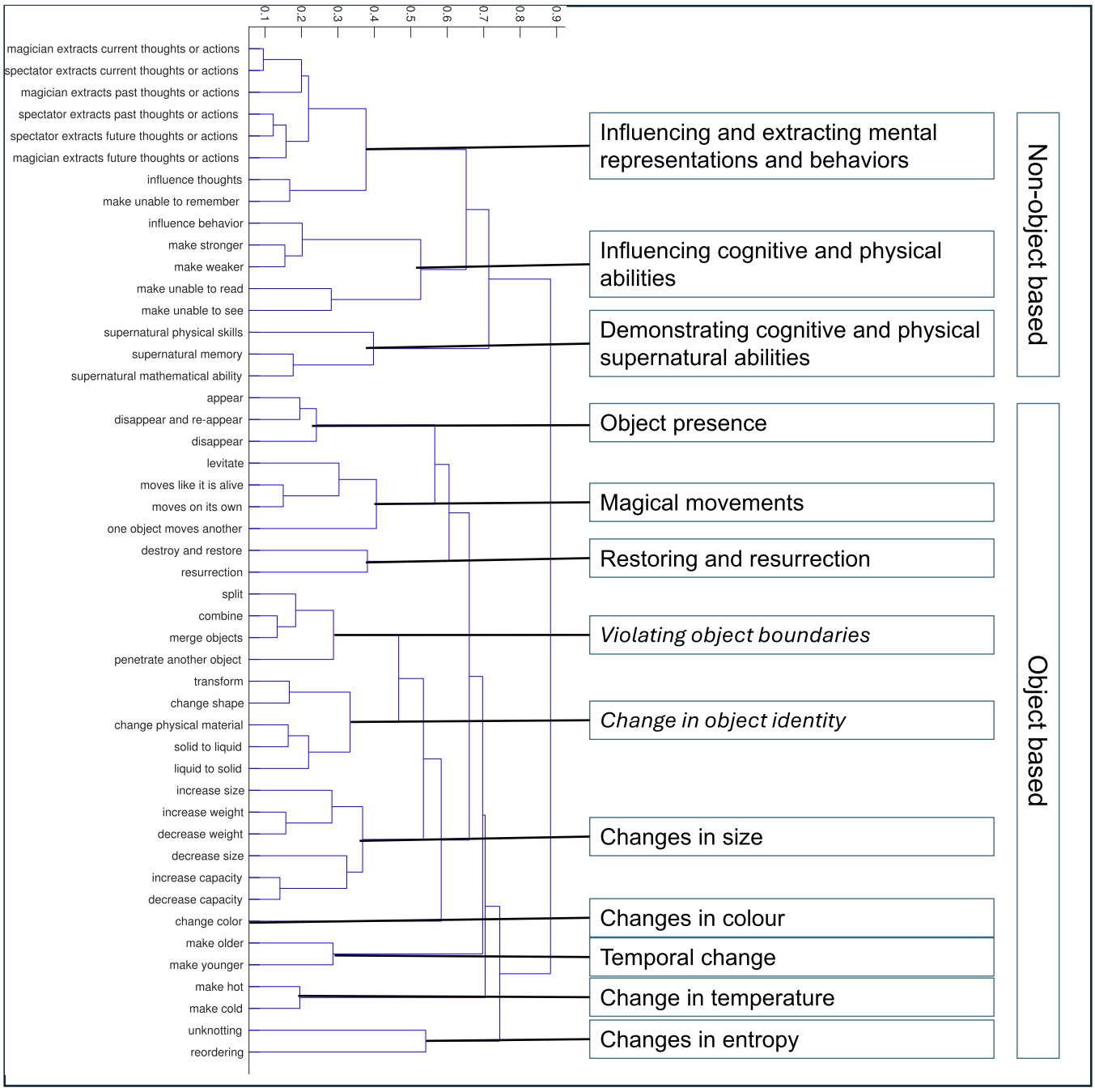

Fig. 1. The folk taxonomy of magical effects inferred from people's similarity judgments. The numerical axis indicates the degree of dissimilarity at which clusters were merged.

grouping includes all effects that involve the display of extraordinary mental or physical capacities, such as enhanced memory, exceptional mathematical ability, or remarkable physical skill. These effects challenge people's beliefs about the upper bounds of human cognitive and physical abilities. This last category of non-object-based effects appears to differ from the two preceding categories in that it does not rely on any form of influence or interaction with the spectator. In this respect, it may lie close to the boundary with non-object-based effects, which are likewise characterized by the absence of active interaction between the magician and the spectator.

2.2.3. *Object based effects*

The dendrogram reveals ten distinct categories of object based effects. Before describing each of these categories, it is worth noting that, unlike non-object-based effects, they rely on a distinct type of prediction error (Sinclair, Manalili, Brunec, Adcock, & Barense, 2021). Indeed, non-object-based effects primarily involve violations of conceptual knowledge about the limits of the human mind and body. In contrast, object-based effects appear to rely on prediction errors related to the physical properties of objects and changes in the external world. In other words, object-based effects depend more heavily on visual and spatial information, whereas non-object-based effects rely more on conceptual processing (for the role of vision in non-mental magic, see Kuhn, Gibgot, Thomas, & Ekroll, 2024). Moreover, it appears that most object-based effects share violations of knowledge that emerge early in child development, such as object permanence (i.e., presence), quantity conservation (i.e., restoration and resurrection, object boundaries), and the constancy of objects despite observable changes (e.g., identity, size,

color, temporal, or thermal properties).

2.2.3.1. Object presence. This category includes effects that involve violations in the presence or continuity of objects, such as appearances, disappearances, and reappearances. These illusions can be understood as breaches in the maintenance of mental object files, which track the existence and location of objects over time. These effects mainly challenge the principle of object permanence (i.e., the understanding that objects persist in existence even when they are no longer perceptually available) (Piaget, 1954).

2.2.3.2. Magical movements. This category encompasses effects that involve the spontaneous or unexplained movement of objects, including those that appear to move autonomously. It also includes levitation effects, which can be interpreted as violations of gravitational constraints or the laws of motion (Baillargeon, 1995; Spelke & Kinzler, 2007).

2.2.3.3. Restoring and resurrection. This category comprises effects in which destroyed or damaged objects are miraculously restored, as well as those depicting the revival of life from apparent death. Such effects represent a recurrent class of magical themes observed in both historical and contemporary taxonomies of magic. These effects represent a violation of intuitive principles of material integrity and mortality (Carey, 2009).

2.2.3.4. Violating object boundaries. These effects involve breaches in the structural integrity or spatial boundaries of objects, such as when objects are split, merged, combined, or penetrate one another. They constitute violations of fundamental physical principles such as cohesion, continuity, and solidity (Baillargeon, 1995; Spelke & Kinzler, 2007).

2.2.3.5. Change in object identity. This category includes effects in which an object is transformed into something else or undergoes changes in shape, material composition, or physical state (e.g., solid to liquid or vice versa). These illusions violate expectations of object constancy and material stability (De Vries, 1969; Flavell, Flavell, & Green, 1983; Piaget, 1954).

2.2.3.6. Changes in size. Effects in this category involve apparent alterations in an object's physical dimensions, including its size, weight, or capacity. They challenge intuitive understandings of mass conservation and proportionality (De Vries, 1969; Flavell et al., 1983; Piaget, 1954).

2.2.3.7. Changes in color. This category includes effects in which an object's color changes, either gradually or instantaneously. Notably, these effects form a perceptually distinct class, differing from other transformations in that they typically alter surface appearance rather than structure or material. They challenge naive expectations about the consistency of object surface properties (De Vries, 1969; Flavell et al., 1983; Piaget, 1954).

2.2.3.8. Temporal changes. This category encompasses effects that involve alterations in temporal properties, such as objects or beings becoming older or younger. These effects violate intuitive expectations about the unidirectional nature of time and irreversible biological or physical processes (Starmans, 2017).

2.2.3.9. Changes in temperature. These effects involve perceptible alterations in temperature, such as objects becoming unexpectedly hot or cold. They violate thermodynamic expectations regarding heat transfer and energy conservation (Flavell et al., 1983).

2.2.3.10. Change in entropy. This category includes effects in which objects appear to undergo spontaneous decreases in entropy, such as disordered items becoming ordered or knotted objects becoming untied (Friedman, 2001). These illusions directly contravene the principle that entropy tends to increase in closed systems. Although this category appears distinct from the previous ones, it may also rely on a principle of object consistency in its original form (e.g., a rope before being tied).

3. Experiment 2 – identifying a folk taxonomy of magical causes

In developing our folk taxonomy of magical effects, we deliberately excluded references to the potential causes underlying each effect. Nonetheless, every magic trick implies some form of "magical" causation—whether this is represented as a mystical gesture or spell, or attributed to extraordinary psychological or technological abilities. In some cases, magicians explicitly frame an effect as lacking any identifiable cause. For example, in certain card tricks where a chosen card rises to the top of the deck, the magician may openly assert that the phenomenon occurs for no apparent reason—it "just happens." In such instances, the absence of an identifiable cause functions as the intended causal attribution perceived by the audience. The aim of the present experiment was to apply the same methodological approach as in Experiment 1 to identify a taxonomy of the different causal attributions used in magic. These attributions are designed to complement and extend the categories of effects identified in the earlier study.

3.1. Method

3.1.1. Participants

A total of 27 participants were recruited from Prolific and paid 12 USD/h, following Princeton University IRB protocol number 10895. Of the 27 participants, 8 self-identified as a man, 18 as a woman, and 1 as other. Reported age in (years) had a mean of 41.3 and standard deviation of 12.8.

3.1.2. Material and procedure

We created a list of 13 causes that are often used to explain a magical effect – use of a magic wand, a spell, a gesture, magic dust, supernatural forces, luck, superhuman memory, strength, or flexibility, reading body language, using a novel technology, and no cause. Collecting similarity judgments for this set of 13 causes required judgments for just 78 pairs, and we collected these judgments in an experiment in which each participant provided ratings on a scale from 0 to 10 for all pairs, randomizing the order of presentation within and across pairs.

3.2. Results

Similarity ratings were divided by 10 to yield normalized similarities that lie between 0 and 1, with 1 indicating perfect similarity and 0 indicating perfect dissimilarity. The IRR for these ratings, with Spearman-Brown correction, was $r(76) = 0.88$. We followed the same procedure as in Experiment 1 to construct a dendrogram reflecting these similarity judgments (see Fig. 2). As before, we calculated the cophenetic correlation between the distances between pairs derived from the dendrogram and the negative similarity judgments to assess how well the taxonomy captured the human data. We found a cophenetic correlation of $r(76) = 0.92$, while datasets without hierarchical structure would be expected to have correlations below 0.6.

3.2.1. Interpretation of the folk taxonomy

The dendrogram seems to highlight five clusters of causes.

3.2.1.1. Magical or unexplained trickery. This category encompasses explanations that attribute the effect to explicitly magical causes, such as wands, spells, magical dust, or supernatural forces. Interestingly, it also includes references to sleight of hand. Although sleight of hand is, in reality, a physical skill, it seems to be grouped with magical causes

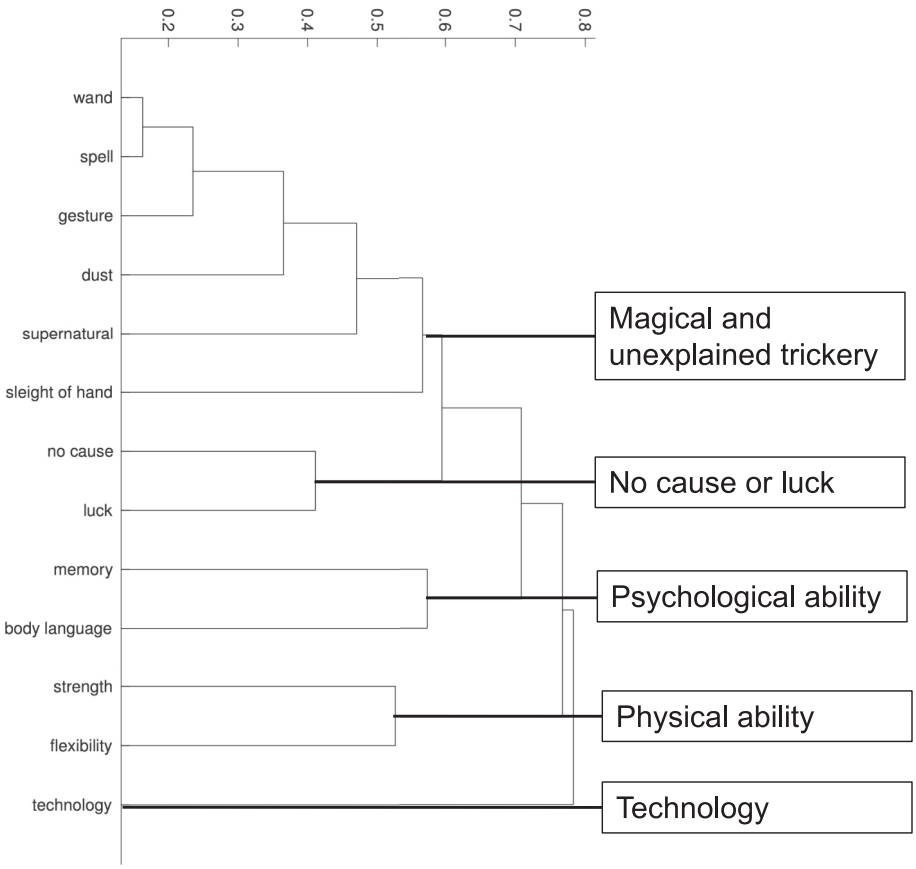

Fig. 2. The folk taxonomy of magical causes inferred from people's similarity judgments. The numerical axis indicates the degree of dissimilarity at which clusters were merged.

rather than with physiological or psychological abilities. The expression "sleight of hand" is frequently invoked as a placeholder explanation when the precise method of the trick is unknown. For instance, when spectators suggest that a magician used sleight of hand to make a coin vanish, they acknowledge that deception is involved but lack knowledge of the actual mechanism. In this sense, sleight of hand may function as an attribution to an unseen or mysterious force, something understood to be non-supernatural, yet still inexplicable.

3.2.1.2. No cause or luck. This category includes effects attributed to chance or to the absence of any discernible cause. Magicians may, for example, claim that an outcome occurred through extraordinary coincidence or pure luck—such as successfully predicting a freely chosen card. These explanations imply that the effect lacks intentional causation, positioning luck and the absence of cause along a similar conceptual dimension.

3.2.1.3. Psychological ability. Attributions within this category involve the magician possessing extraordinary psychological skills, such as enhanced memory, or the ability to read subtle cues in body language. These explanations are particularly common in mentalism, where performances are often framed around the performer's exceptional cognitive or perceptual abilities rather than overt trickery or supernatural causes.

3.2.1.4. Physical human ability. This category refers to effects that are explained through exceptional physical capacities, such as strength or flexibility. Classic escapology performances—exemplified by Houdini's acts—often fall into this group, as they are presented as demonstrations of extraordinary bodily control rather than deception or supernatural power.

3.2.1.5. Technology. The final category comprises explanations that attribute the effect to technological means. In these cases, spectators may assume that advanced technologies are responsible for the outcome. Notably, this attribution appears to form a distinct explanatory class, differing qualitatively from attributions grounded in human or magical abilities.

4. Discussion

Magic provides a uniquely valuable lens through which to explore the boundaries of what people consider possible and the mechanisms by which these boundaries can be extended. Although there exists an effectively infinite number of magic tricks, relatively little is known about how these effects relate to one another. Developing a meaningful taxonomy of magic enables researchers to link different types of effects to the underlying beliefs about how the world operates (Griffiths, 2015; Lewry et al., 2021). Previous attempts to classify magic have largely relied on the judgments of a small number of experts, rather than capturing people's intuitive understanding of magical phenomena. In the present study, we evaluated our taxonomy by asking participants to assess the perceived similarity between tricks representing each category. This method ensures that the resulting taxonomy is psychologically grounded. Furthermore, the dendrogram analysis allowed us to cluster tricks according to perceived similarity, thereby revealing a hierarchical structure that reflects the cognitive organization of magical effects.

Our analysis corroborates several key distinctions traditionally made by magicians—for instance, the separation between mental and physical effects—while also revealing subtler patterns in how people perceive magic that have not been previously documented. Notably, effects that involve manipulating the spatial arrangement of objects appear to form

a distinct subgroup within the broader category of physical effects. To complement this taxonomy of magical effects, we conducted a parallel analysis examining how people perceive the similarity between different magical causes. This analysis revealed a coherent pattern of perceived causal categories that can plausibly be interpreted as magical. Unexpectedly, these also encompassed sleight of hand. Although sleight of hand might intuitively be associated with physical dexterity or motor skill, our findings suggest that observers instead tend to attribute such manipulations to an unspecified or unknown causal force—indicating that even naturalistic techniques can, perceptually, occupy the same psychological space as ostensibly "supernatural" causes. Future research may examine more directly what people mean about sleight of hand to learn more about the extent to which it occupies the same space as supernatural causation. Experiment 2 provides preliminary evidence that causal attributions may form a second dimension of the taxonomy; however, given the smaller sample, limited stimulus set, and heterogeneity of causal attributions, this conclusion remains provisional and requires larger, more targeted follow-up work. For example, it is possible that other causes may emerge as magicians develop new ways of framing their effects. It is important to note that at times the framing of the effect can overlap with actual methods. For example, most magic tricks rely on misdirection to conceal the true cause of the effect, but magic tricks may also be framed as being demonstrations of misdirection. As people's world views change, these causal attributions may also become more fluid, and may require adaptation.

Our folk taxonomy has several advantages over previous taxonomies. Rather than merely listing different types of magical effects in an arbitrary sequence, our taxonomy provides a hierarchical structure that allows for direct comparison between categories. This organization makes it possible to determine the relative similarity between effects: magic tricks that fall into different clusters are psychologically perceived as more distinct than those within the same cluster. Future research may try to focus on the key psychological features that makes these tricks more similar. For example, our taxonomy reveals a clear distinction between object-based and non-object-based effects, reflecting a relatively straightforward difference in the underlying cognitive processes involved. However, within these broad categories, more subtle distinctions also emerged. In particular, participants reliably distinguished between effects involving object identity and those involving object size, suggesting that these properties may be supported by partially distinct mental representations.

Importantly, our taxonomy reflects how people intuitively experience different effects, rather than how experts conceptually organize them. As such, it is more grounded in psychological mechanisms underlying perception and belief. Magic, of course, is an immensely complex art form, and each trick depends on multiple additional factors, including performance context, narrative framing, and the specific objects involved (Lamont, 2015). Audiences are likely to respond very differently to a magician making a coin vanish than to the disappearance of a helicopter (Jay, 2016). These contextual variables play a crucial role in shaping the subjective experience of a magic effect, and we do not intend to diminish their importance. Instead, we regard the present taxonomy as an essential stepping stone toward a more comprehensive understanding of how people conceptualize magic. The multidimensional nature of this framework means that future refinements can readily incorporate such additional factors.

Our taxonomy is based on linguistic descriptions of magic tricks rather than on participants actually experiencing the tricks. Using verbal descriptions of general magic effects allowed us to focus on their essential features without introducing the variability that naturally arises from differences in performance style. Doing so allowed us to look at how people intuitively understand the psychological similarities between different effects and their causes. This method has been effectively used in previous magic research (Griffiths, 2015; Shtulman & Morgan, 2017), but it also means that our taxonomy reflects semantic rather than experiential similarities. Now that we have established the core conceptual framework, future studies could investigate how people respond when they experience these effects directly.

A central feature of our "folk taxonomy" is the separation of effect and cause as distinct entities. This distinction addresses one of the major limitations of earlier classification systems, which often struggled to categorize specific tricks because their categories were not mutually exclusive and frequently conflated the effect with its presumed cause. For instance, a mentalist's demonstration in which the performer appears to deduce a chosen card through psychological cues is experienced very differently from one in which they claim to use genuine telepathy. Traditional taxonomies have difficulty accommodating such differences. In our framework, both are classified under the effect of information extraction, yet they are distinguished by their differing causal attributions.

Similarly, many prior systems have been overly constrained by the physical objects involved in the performance. A magic trick in which a magician makes a lion disappear is typically labelled a "stage illusion," whereas vanishing a coin is categorized as a "close-up trick," despite both sharing the same underlying effect—the disappearance of an object. Our taxonomy avoids this object-based bias by focusing instead on the psychological structure of the perceived effect and its cause. This allows for a more flexible and cognitively meaningful understanding of how audiences interpret and organize magical phenomena.

Our folk taxonomy carries significant implications for both the art of magic and the scientific understanding of people's beliefs about the world. From an artistic standpoint, the taxonomy offers a novel framework for categorizing and cataloguing magic tricks in a systematic and psychologically grounded manner. Previous taxonomies have had limited practical impact, in part because of the inherent difficulty in consistently classifying magic effects that often defy rigid categorization. The multidimensional structure of our taxonomy provides the necessary flexibility to accommodate this diversity, allowing tricks to be organized according to perceived similarity rather than arbitrary criteria. Nonetheless, we acknowledge that the practical utility and consistency of this system require further formal evaluation. For practitioners, the taxonomy offers a means of understanding the perceptual and conceptual relationships between different tricks. By clarifying which effects are experienced as similar or distinct, magicians can design performances that are more varied and engaging, avoiding redundancy in perceptual or conceptual impact. In this way, our taxonomy not only contributes to the theoretical understanding of cognition but also provides a practical resource for creative development within the art of magic.

Magic tricks depend on creating experiences that directly conflict with our intuitive understanding of the physical world. Our responses to magical effects are therefore likely to reflect deeper, underlying beliefs about how the world operates. In this sense, magic offers a distinctive window into our intuitive physics (Griffiths, 2015; Lewry et al., 2021; McCoy & Ullman, 2019; Shtulman & Morgan, 2017) and, more broadly, into the implicit theories that shape our everyday reasoning about causality and possibility. Understanding the cognitive mechanisms that underpin such physical reasoning has important implications for how we perceive, predict, and interpret events in our environment (Kubricht, Holyoak, & Lu, 2017). Moreover, identifying systematic biases in these beliefs is crucial for uncovering the constraints of human cognition. Our folk taxonomy of magic represents a first step toward harnessing this unique domain as a tool for exploring the structure and limitations of intuitive belief systems.

CRediT authorship contribution statement

Gustav Kuhn: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Cyril Thomas:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Thomas L. Griffiths:** Writing – review

& editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

None.

Acknowledgements

We thank Raja Marjieh for assistance with data collection.

Appendix A. List of magical effects

The magician makes an object appear.
The magician makes an object disappear.
The magician splits one object into two objects.
The magician combines two objects into one object.
The magician transforms an object into a different object.
The magician changes the shape of an object.
The magician changes the color of an object.
The magician increases the size of an object.
The magician decreases the size of an object.
The magician increases the physical capacity of an object so it can hold more than it should.
The magician decreases the physical capacity of an object so it can hold less than it should.
The magician increases the weight of an object.
The magician decreases the weight of an object.
The magician makes an object levitate.
The magician turns a stationary object into an object that moves like it is alive.
The magician turns a stationary object into an object that moves on its own.
The magician changes the physical material of an object.
The magician makes a solid object penetrate another solid object without causing any damage.
The magician makes a solid object into a liquid.
The magician makes a liquid into a solid object.
The magician merges one object into another object.
The magician makes an object disappear from one location and appear in another location.
The magician destroys an object and magically restores it.
The magician resurrects a dead organism which becomes alive.
The magician unknots an object that was knotted.
The magician puts a mixed-up set of objects back in order.
The magician makes an object older.
The magician makes an object younger.
The magician makes an object heat up.
The magician makes an object cool down.
The magician moves one object and it appears to make another object move even though there is no physical connection between them.
The magician influences a spectator's thoughts.
The magician influences a spectator's physical behavior.
The magician extracts information about something that the spectator did or thought in the past.
The magician makes a spectator extract information about something that another spectator did or thought in the past.
The magician extracts information about something that the spectator is currently doing or thinking.
The magician makes a spectator extract information about something that another spectator is currently doing or thinking.
The magician extracts information about something that the spectator will do or think in the future.
The magician makes a spectator extract information about something that another spectator will do or think in the future.
The magician makes a spectator physically stronger.
The magician makes a spectator physically weaker.
The magician makes a spectator unable to read.
The magician makes a spectator unable to see.
The magician makes a spectator unable to accurately remember an event.
The magician demonstrates supernatural physical skills.
The magician demonstrates supernatural memory.
The magician demonstrates supernatural mathematical ability'.

Appendix B. List of magical causes

The magician performs a magic trick in which there is no apparent cause that caused the effect.
The magician performs a magic trick in which the magician making magical gestures caused the effect.
The magician performs a magic trick in which a magic wand caused the effect.
The magician performs a magic trick in which magic dust caused the effect.
The magician performs a magic trick in which the magician saying a magic spell caused the effect.
The magician performs a magic trick in which supernatural forces caused the effect.
The magician performs a magic trick in which the magician's skill in memory caused the effect.
The magician performs a magic trick in which the magician's skill in reading body language caused the effect.
The magician performs a magic trick in which the magician's skill in sleight of hand caused the effect.
The magician performs a magic trick in which the magician's strength caused the effect.
The magician performs a magic trick in which the magician's flexibility caused the effect.
The magician performs a magic trick in which a new technology caused the effect.
The magician performs a magic trick in which luck or coincidence caused the effect.'

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cognition.2026.106610.

References

Baillargeon, R. (1995). Physical reasoning in infancy. *The Cognitive Neurosciences*, 181–204.
Benassi, V. A., Singer, B., & Reynolds, C. B. (1980). Occult Belief - Seeing Is Believing. *Journal for the Scientific Study of Religion, 19*(4), 337–349. ://A1980KY59500002.
Blackstone, H., Reynolds, C., & Reynolds, R. (1985). *The Blackstone book of magic & illusion*. Newmarket Press.
Brugger, P., & Mohr, C. (2008). The paranormal mind: How the study of anomalous experiences and beliefs may inform cognitive neuroscience. *Cortex, 44*(10), 1291–1298. https://doi.org/10.1016/j.cortex.2008.05.008
Carey, S. (2009). *The origin of concepts*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195367638.001.0001
De Vries, R. (1969). Constancy of generic identity in the years three to six. *Monographs of the Society for Research in Child Development, 34*(3), iii–67.
Fitzkee, D. (1944). *The trick brain*. San Rafae House.
Flavell, J. H., Flavell, E. R., & Green, F. L. (1983). Development of the appearance-reality distinction. *Cognitive Psychology, 15*(1), 95–120.
Friedman, W. J. (2001). The development of an intuitive understanding of entropy. *Child Development, 72*(2), 460–473.
Griffiths, T. L. (2015). Revealing ontological commitments by magic. *Cognition, 136*, 43–48. https://doi.org/10.1016/j.cognition.2014.10.019
Gunasekara, N. (2017). *Secular magic classification: A journey through the classifications of conjuring arts*. Unicolour Graphic & Print.
Jay, J. (2016). What do audiences really think. *MAGIC*, 46–55 (September).
Kelley, H. H. (1980). Magic tricks: The management of causal attributions. In D. Gurlitz (Ed.), *Perspectives on attribution research and theory: The Bielefeld symposium*.

Kubricht, J. R., Holyoak, K. J., & Lu, H. (2017). Intuitive physics: Current research and controversies. *Trends in Cognitive Sciences, 21*(10), 749–759. https://doi.org/10.1016/j.tics.2017.06.002

Kuhn, G. (2019). *Experiencing the impossible: The science of magic*. MIT Press.

Kuhn, G., Amlani, A. A., & Rensink, R. A. (2008). Towards a science of magic. *Trends in Cognitive Sciences, 12*(9), 349–354. https://doi.org/10.1016/j.tics.2008.05.008

Kuhn, G., Caffaratti, H. A., Teszka, R., & Rensink, R. A. (2014). A psychologically-based taxonomy of misdirection. *Frontiers in Psychology, 5*, Article 1392. https://doi.org/10.3389/fpsyg.2014.01392

Kuhn, G., Gibgot, T., Thomas, C., & Ekroll, V. (2024). Magic for the blind: Are auditory tricks impossible? *Trends in Cognitive Sciences, 28*(11), 971–973. https://doi.org/10.1016/j.tics.2024.09.001

Kuhn, G., Ortega, J., Simmons, K., Thomas, C., & Mohr, C. (2023). Experiencing misinformation: The effect of pre-exposure warnings and debunking on psychic beliefs. *Quarterly Journal of Experimental Psychology, 76*(6), 1445–1456. https://doi.org/10.1177/17470218221116437

Lamont, P. (2015). Problems with the mapping of magic tricks [opinion]. *Frontiers in Psychology, 6*. https://doi.org/10.3389/fpsyg.2015.00855

Lamont, P., & Wiseman, R. (1999). *Magic in theory*. Hermetic Press.

Leddington, J. (2016). The experience of magic. *The Journal of Aesthetics and Art Criticism, 74*(3), 253–264.

Lewry, C., Curtis, K., Vasilyeva, N., Xu, F., & Griffiths, T. L. (2021). Intuitions about magic track the development of intuitive physics. *Cognition, 214*, Article 104762. https://doi.org/10.1016/j.cognition.2021.104762

Macknik, S. L., King, M., Randi, J., Robbins, A., Teller, Thompson, J., & Martinez-Conde, S. (2008). Attention and awareness in stage magic: Turning tricks into research. *Nature Reviews. Neuroscience, 9*(11), 871–879. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=18949833.

McCoy, J., & Ullman, T. (2019). Judgments of effort for magical violations of intuitive physics. *PLoS One, 14*(5), Article e0217513. https://doi.org/10.1371/journal.pone.0217513

Medin, D. L., & Atran, S. (1999). *Folkbiology*. Mit Press.

Mohr, C., Koutrakis, N., & Kuhn, G. (2015). Priming psychic and conjuring abilities of a magic demonstration influences event interpretation and random number generation biases [original research]. *Frontiers in Psychology, 5*(1542). https://doi.org/10.3389/fpsyg.2014.01542

Olson, J. A., Demacheva, I., & Raz, A. (2015). Explanations of a magic trick across the life span [original research]. *Frontiers in Psychology, 6*. https://doi.org/10.3389/fpsyg.2015.00219

Pailhès, A., Rensink, R. A., & Kuhn, G. (2020). A psychologically based taxonomy of magicians' forcing techniques: How magicians influence our choices, and how to use this to study psychological mechanisms. *Consciousness and Cognition, 86*, Article 103038. https://doi.org/10.1016/j.concog.2020.103038

Parris, B. A., Kuhn, G., Mizon, G. A., Benattayallah, A., & Hodgson, T. L. (2009). Imaging the impossible: An fMRI study of impossible causal relationships in magic tricks. *Neuroimage, 45*(3), 1033–1039. https://doi.org/10.1016/j.neuroimage.2008.12.036

Piaget, J. (1954). *The construction of reality in the child*. Basic Books.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*(4), 515–526.

Rensink, R. A., & Kuhn, G. (2015a). A framework for using magic to study the mind [Hypothesis & Theory]. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.01508

Rensink, R. A., & Kuhn, G. (2015b). The possibility of a science of magic [opinion]. *Frontiers in Psychology, 6*. https://doi.org/10.3389/fpsyg.2015.01576

Robert-Houdin, J. E. (1878). *(Translated and edited by Prof. Hoffman). Secrets of conjuring and magic*. Routledge.

Rohlf, F. J., & Fisher, D. R. (1968). Tests for hierarchical structure in random data sets. *Systematic Biology, 17*(4), 407–412.

Russell, J. (2013). *Agency: Its role in mental development*. Psychology Press.

Shtulman, A., & Morgan, C. (2017). The explanatory structure of unexplainable events: Causal constraints on magical reasoning [journal article]. *Psychonomic Bulletin & Review*. https://doi.org/10.3758/s13423-016-1206-3

Silvia, P. J., Crasson, S. J., Greengross, G., & Kuhn, G. (2025). More than just a magic trick? Exploring an audience's supernatural attributions for magicians' performances. *Personality and Individual Differences, 246*, Article 113306. https://doi.org/10.1016/j.paid.2025.113306

Sinclair, A. H., Manalili, G. M., Brunec, I. K., Adcock, R. A., & Barense, M. D. (2021). Prediction errors disrupt hippocampal representations and update episodic memories. *Proceedings of the National Academy of Sciences, 118*(51), Article e2117625118.

Sokal, R. R., & Michener, C. D. (1958). *A statistical method for evaluating systematic relationships*.

Sokal, R. R., & Rohlf, F. J. (1962). The comparison of dendrograms by objective methods. *Taxon, 11*(2), 33–40.

Spelke, E. S., & Kinzler, K. D. (2007). Core knowledge. *Developmental Science, 10*(1), 89–96.

Starmans, C. (2017). Children's theories of the self. *Child Development, 88*(6), 1774–1785.

Subbotsky, E. (2001). Causal explanations of events by children and adults: Can alternative causal modes coexist in one mind? *British journal of developmental psychology, 19*, 23–45. <Go to ISI>://000167917700003.

Thomas, C., Didierjean, A., Maquestiaux, F., & Gygax, P. (2015). Does magic offer a cryptozoology ground for psychology? *Review of General Psychology, 19*(2), 117–128. https://doi.org/10.1037/gpr0000041

Zalla, T., Miele, D., Leboyer, M., & Metcalfe, J. (2015). Metacognition of agency and theory of mind in adults with high functioning autism. *Consciousness and Cognition, 31*, 126–138.