

Scientific Report

The cognitive basis of naïve sociology - OTKA 109352

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One of the distinctive features of the human race is its unique sociality. Research has shown that people are ready to use a variety of cues to draw distinctions between „us” and „them”. Theories of social categorization share common assumptions: in-group bias may benefit an individual as it helps them to boost their own self-esteem (Tajfel & Turner, 1986) or provides an ideological ground for oppressing others (Sidanius & Pratto, 1994).

Past research in developmental psychology has already provided insight into children’s representations of the social world. It has been shown that infants as young as only a few months of age categorize others based on gender (Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). They even do so for language (Kinzler, Dupoux, & Spelke, 2007), which has been identified as a reliable indicator of group-membership for infants. While there is emergent evidence that already infants form ‘social categories’, little is known about the fact whether infants’ social categories reflect an “in-group” preference per se, or a preference for people sharing traits with those in their environment.

There are recent results showing that categorization in humans serves more than their need to belong and affiliate with a group, any group (see minimal group paradigm, Tajfel et al, 1971). Rather, social categorization is driven by humans’ motivation to map what others know which, in turn, can be used to identify those people with whom they should strive to reach a shared set of knowledge, i.e. learn from. This notion is supported by findings showing that language is a stronger categorization cue for infants than race is (Kinzler and Spelke, 2011). The language a person speaks carries more information about his/her knowledge (representations) than race does, as language marks the borders of a stable, shared representational space - culture. These shared representations make us, individuals, a group. However, people differ in how much of the group forming shared knowledge they possess, for instance due to their young age. Part of the culturally shared knowledge may not be shared with novices yet, they should nevertheless strive to acquire all of that knowledge eventually. The challenge is to identify those informants whose behavior reliably shows the shared knowledge of the group they want to belong to.

We propose that naïve sociology serves the function to identify the borders of shared knowledge. In line with this, we argue that any behavioral cue that indicates that a person shares the knowledge space of the target group/culture will lead infants to categorize that person as “in-group” which, in turn, will necessarily induce an epistemic trust towards any information that person may manifest later on, even if that is not yet part of the perceivers knowledge base. Thus, naïve sociology contributes to the selectivity of social learning: when receiving a novel bit of information from a representative of shared knowledge, that piece of information is treated as part of the same representational space.

In other words, the central question of this research project focused on the role of the ability to categorize social partners in the environment for the developing mind. More precisely, we wanted to see whether this ability influences epistemic development as well, beyond the enrichment of social-emotional competencies.

The studies of this project, in our view, have deepened our knowledge on the interdependence of social categorization and social learning. In the following we introduce the set of studies and their results we conducted under this project.

Published papers

Oláh, K., Elekes, F., Bródy, G., & Király, I. (2014). Social category formation is induced by cues of sharing knowledge in young children. *PloS one*, 9(7), e101680.

Previous research has shown that human infants and young children are sensitive to the boundaries of certain social groups, which supports the idea that the capacity to represent social categories constitutes a fundamental characteristic of the human cognitive system. However, the function this capacity serves is still debated. We propose that during social categorization the human mind aims at mapping out social groups defined by a certain set of shared knowledge. An eye-tracking paradigm was designed to test whether two-year-old children differentially associate conventional versus non-conventional tool use with language-use, reflecting an organization of information that is induced by cues of shared knowledge. Children first watched videos depicting a male model perform goal-directed actions either in a conventional or in a non-conventional way. In the test phase children were presented with photographs taken of the model and of a similarly aged unfamiliar person while listening to a foreign (Experiment 1) or a native language (Experiment 2) text. Upon hearing the foreign utterance children looked at the model first if he had been seen to act in an unconventional way during familiarization. In contrast, children looked at the other person if the model had performed conventional tool use actions. No such differences were found in case of the native language. The results suggest that children take the conventionality of behavior into account in forming representations about a person, and they generalize to other qualities of the person based on this information

Oláh, K., Kupán, K., Csík, A., Király, I., & Topál, J. (2015). Feature or location? Infants and adults adopt different strategies to search for a hidden toy in an ambiguous task. *Infant Behavior and Development*, 41, 73-79.

Evidence suggests that infants and adults attribute different importance to certain object properties when performing object-directed actions. Namely, infants tend to rely on information about an object's location, whereas adults are more likely to base their actions on its features. In this study, we tested whether the strategic choices of infants (aged 13 months) and adults would be modified by the context of the demonstration. Participants watched as an experimenter hid a ball under one of two different coloured containers, using either a communicative or a non-communicative manner. Then, the locations of the two containers were changed out of sight of the participant. During the test, participants were encouraged to look for the ball under one of the containers. We found that adults were more likely to follow a feature-based strategy than infants. However, there was no effect of the context of the demonstration, suggesting that communication may play different roles in encoding object properties and directing overt behaviour.

Elekes, F., Bródy, G., Halász, E., Király, I. (2016). Enhanced encoding of the co-actor's target stimuli during a shared non-motor task. *The Quarterly Journal of Experimental Psychology* 69, 2376-2389.

Task co-representation has been proposed to rely on the motor brain areas' capacity to represent others' action plans similarly to one's own. The joint memory (JM) effect suggests that working in parallel with others influences the depth of incidental encoding: Other-relevant items are better encoded than non-task-relevant items. Using this paradigm, we investigated whether task co-representation could also emerge for non-motor tasks. In Experiment 1, we found enhanced recall performance to stimuli relevant to the co-actor also when the participants' task required non-motor responses (counting the target words) instead of key-presses. This suggests that the JM effect did not depend on simulating the co-actor's motor responses. In Experiment 2, direct visual access to the co-actor and his actions was found to be unnecessary to evoke the JM effect in case of the non-motor, but not in case of the motor task. Prior knowledge of the co-actor's target category is sufficient to evoke deeper incidental encoding. Overall, these findings indicate that the capacity of task co-representation extends beyond the realm of motor tasks: Simulating the other's motor actions is not necessary in this process.

Oláh, K., Elekes, F., Petó, R., Peres, K., & Király, I. (2016). 3-Year-Old Children Selectively Generalize Object Functions Following a Demonstration from a Linguistic In-group Member: Evidence from the Phenomenon of Scale Error. *Frontiers in Psychology*, 7, 963. <http://doi.org/10.3389/fpsyg.2016.00963>

The present study investigated 3-year-old children's learning processes about object functions. We built on children's tendency to commit scale errors with tools to explore whether they would selectively endorse object functions from a linguistic in-group over an out-group model. Participants ($n = 37$) were presented with different object sets, and a model speaking either in their native or a foreign language demonstrated how to use the presented tools. In the test phase, children received the object sets with two modifications: the original tool was replaced by one that was too big to achieve the goal but was otherwise identical, and another tool was added to the set that looked different but was appropriately scaled for goal attainment. Children in the *Native* language condition were significantly more likely to commit scale errors – that is, choose the over-sized tool – than children in the *Foreign* language condition (48 vs. 30%). We propose that these results provide insight into the characteristics of human-specific learning processes by showing that children are more likely to generalize object functions to a category of artifacts following a demonstration from an in-group member.

Elekes, F., Varga, M., & Király, I. (2016). Evidence for spontaneous level-2 perspective taking in adults. *Consciousness and cognition*, 41, 93-103.

Social interactions are fostered by humans' propensity to compute their partner's perspective online. However, due to the mindreading system's limited capacity perspective taking (PT) was argued to occur spontaneously only for level-1, but not level-2 perspectives. We propose that level-2 perspectives (containing aspectual information) can also be computed

spontaneously if participants have reason to assume that the partner is indeed aware of the objects' aspectual properties. Pairs of adult participants took part in the modified version of Surtees, Butterfill, and Apperly's (2012) number verification paradigm. Participants had prior information on their partner's task, which either called for processing aspectual properties or did not. The partner's inconsistent perspective was found to interfere with RT-s providing evidence for spontaneous level-2 PT. However, such interference only occurred when the partner's task involved processing the perspective dependent object feature, suggesting that PT was sensitive to the other's awareness of the to be represented information.

Oláh, K., Elekes, F., Turcsán, B., Kis, O., & Topál, J. (2016). Social Pre-treatment Modulates Attention Allocation to Transient and Stable Object Properties. *Frontiers in psychology*, 7.

Increasing evidence suggests that ostensive-communicative signals in social learning situations enable observers to focus their attention on the intrinsic features of an object (e.g., color) at the expense of ignoring transient object properties (e.g., location). Here we investigated whether off-line social cues, presented as social primes, have the same power to modulate attention allocation to stable and transient object properties as on-line ostensive-communicative cues. The first part of the experiment consisted of a pre-treatment phase, where adult male participants either received intensive social stimulation or were asked to perform non-social actions. Then, they participated in a change detection test, where they watched pairs of pictures depicting an array of five objects. On the second picture, a change occurred compared to the first picture. One object changed either its location (moving forward or backward) or was replaced by another object, and participants were required to indicate where the change had happened. We found that participants detected the change more successfully if it had happened in the location of the object; however, this difference was reduced following a socially intense pre-treatment phase. The results are discussed in relation to the claims of the natural pedagogy theory.

Elekes, F., Varga, M., & Király, I. (2016). Evidence for spontaneous level-2 perspective taking in adults. *Consciousness and cognition*, 41, 93-103.

Social interactions are fostered by humans' propensity to compute their partner's perspective online. However, due to the mindreading system's limited capacity perspective taking (PT) was argued to occur spontaneously only for level-1, but not level-2 perspectives. We propose that level-2 perspectives (containing aspectual information) can also be computed spontaneously if participants have reason to assume that the partner is indeed aware of the objects' aspectual properties. Pairs of adult participants took part in the modified version of Surtees, Butterfill, and Apperly's (2012) number verification paradigm. Participants had prior information on their partner's task, which either called for processing aspectual properties or did not. The partner's inconsistent perspective was found to interfere with RT-s providing evidence for spontaneous level-2 PT. However, such interference only occurred when the partner's task involved processing the perspective dependent object feature, suggesting that PT was sensitive to the other's awareness of the to be represented information.

Király, I., & Buttelmann, D. (2017). Editorial: Learning in Social Context: The Nature and Profit of Living in Groups for Development. *Frontiers in Psychology*, 8, 336.

The present paper is an editorial to the research topic edited by Ildikó Király and David Buttelmann in *Frontiers in Psychology*. The central question of this research topic focused on the role of the ability to categorize social partners in the environment for the developing mind. More precisely, we wanted to see whether this ability influences epistemic development as well, beyond the enrichment of social-emotional competencies. Papers appearing in the Research Topic provided evidence that social categorization plays an active role in guiding learning processes, contributing to humans capacity to acquire a large amount of culture-specific knowledge in a relatively short time.

Submitted manuscripts and manuscripts in preparation

Oláh, K. & Király, I. Selective Imitation of Conventional Tool-Users by 3-Year-Old Children. *Under review in Child Development*

This study investigated whether toddlers would selectively imitate a demonstrator who exhibits familiarity with cultural practices in their tool-using habits over a demonstrator who consistently uses tools in an unconventional way. 3-year-old children (n=45) watched videos depicting two models, one of whom performed tool-using actions in a conventional way, while the other model deviated from social conventions. Then, both models introduced a technique to build a tower (differing in one element). Moreover, the context of the demonstration was also manipulated: in one condition, the models expressed their teaching intentions, while in the other, they performed the actions without communicative signals. Children were more willing to copy the actions of the conventionally behaving model, irrespective of the context of the demonstration.

Pető, R., Elekes, F., Oláh, K. & Király, I. Learning how to use a tool – children select to learn functions (but not affordances) from cultural in-group models. *Submitted to Journal of Experimental Child Psychology*

The present study investigated the effects of culture on the process of 4 years old children's function learning. In our experiment, we principally built on the phenomenon of functional fixedness, that is, children's tendency to treat functions as mutually exclusive. After learning that a tool can achieve a given function, children tend to choose a novel tool for accomplishing a novel function. As functions are culturally defined properties, we hypothesized that functional fixedness would be stronger if children perceived the source of function information as a cultural in-group member, as opposed to an out-group member. Participants (n = 39) were presented with four object sets by a model who previously spoke either in their native or in a foreign language. During the test phase, children encountered new purposes, for what they could use the already familiar tools' color variants or other functionally equivalent but thus far unseen tools. Our results confirmed our hypothesis, children preferred to use the new tool for the new function only in the cultural in-group (native language) condition (63.3% vs. 42.7%). Based on these findings, we propose that children at the age of 4 years already treat functions as culture-specific. The mutual exclusivity principle in the domain of function learning is used more flexibly than previously proposed.

Oláh, K., Elekes, F. & Király, I. (in prep). Encoding social categories based on shared cultural knowledge in adults.

The present study investigated whether adults rely on cues of shared cultural knowledge when forming category representations of fellow humans. The study used a modified version of the memory confusion paradigm, where participants are presented with photographs of people differing along a certain social category distinction while listening to utterances associated with the pictures. In the test phase, the task is to match each utterance to the person whose picture it was associated with. When category representations are formed along a certain distinction, more within-group than between-groups errors are expected. Experiment 1 (n=49) contrasted the use of two possible cues in social category representations: race and shared cultural knowledge. Participants were presented with pictures depicting six people belonging to two different ethnicities based on skin color, while the utterances included statements that showed whether the person was familiar with cultural practices specific to the participants' society. In Experiment 2 (n=31), race as a potential basis for social categorization was removed and the only distinction available was based on the content of the utterances. The results indicate that people incorporate information about shared cultural knowledge in their representations of social categories, but this effect may be less robust than those elicited by visual cues.

Posters (with data not covered by the publications and prepared papers)

Oláh, K. & Topál, J. (2015). Oxytocin modulates social categorization processes. Poster Presented at DUCOG 2015, Dubrovnik, May 21-23, 2015.

Research from the past years has pointed out the importance of the neuropeptide oxytocin in regulating various aspects of social interactions, such as inter-group behavior. This study explores the question whether such effects may also be present in social categorization processes. 24 adult males participated in the study with an age range of 18-35 years. In the first part of the experiment, half of the participants received intranasal oxytocin, while the other half was given placebo. After a 40-minute-long waiting period, participants' categorization processes were assessed with the memory confusion paradigm. Participants watched a presentation that showed pictures of six adult men -three belonging to the Caucasian and three to the African-American racial group. Each face was presented seven times and the photographs were always accompanied with an utterance. In the test phase, participants had to match the sentences to the faces from memory and the pattern of errors was analyzed. The classical results obtained with this paradigm show that people commit more within-group than between-group errors, which shows that people organize information based on social category membership. Our preliminary results indicate that this effect can be mitigated by the oxytocin administration.

Oláh, K., Elekes, F., Király, I. (2016). The Relative Importance of Race and Conventionality of Behavior in Young Children's Representations of Social Categories. Poster presented at ICIS 2016, New Orleans, LA, USA, 26-28 May, 2016.

In this study, we investigated whether 18-month-old children take the observed behavior or the race of another person as a stronger indication of their social group membership. We

propose that children sensitivity to language emerges as part of their tendency to detect discrepancies in cultural knowledge (Oláh et al., 2012); therefore their representations of social groups will be formed based on indications of shared knowledge. Children watched videos of two people differing in race perform simple tool-using actions. Crucially, the racial out-group model performed the actions the conventional way, adhering to the cultural norms of the participating children's country. The racial in-group model, however, committed violation of the cultural norms. In the test phase, the two models appeared side-by-side with their mouths covered while either a Hungarian (native) or a Japanese (foreign) text was playing from the speakers. We analyzed the amount of time children spent looking at the two models during the test phase. We hypothesized that if children associated the foreign language with unconventional behavior more strongly than with unfamiliar appearances, than they would spend more time looking at the racial in-group model in the foreign language condition. Preliminary results (n=22) show that overall, children spent more time looking at the racial out-group model, however this tendency was even stronger when the native text was playing (63% vs. 57% of the time). Looking times at the racial in-group model increased when children heard a non-native text (43 vs. 37 %).

Lívia Priyanka Elek, Renáta Szücs, Ildikó Király & Katalin Oláh (2016). The effect of language familiarization on children's tendency to imitate a linguistic out-group model. Poster presented at BCCCD16, Budapest, Hungary, 5-7 January, 2016.

There are several cues to differentiate between in-group and out-group members, of which language seems to be of special importance even to young children . In this study, we tested the effects of familiarization with a foreign language on children's tendency to imitate a linguistic out-group model. 62 children, aged 43-52 months have participated in the study. The process of familiarization was carried out in the course of four days with the help of childrens' cartoons and songs. To test our hypothesis, an imitation task was used. In a between-subjects design, 4 conditions were created based on the language of the familiarization and that of the model. Two of these included familiarization with a foreign language (Czech), while in the other two conditions, we used songs and cartoons in the children's native language during familiarization (Hungarian). In the test phase, children who participated in the Hungarian familiarization either saw a Czech (non-familiar foreign) or a Hungarian (native) speaking model perform a simple action, while those who were familiarized with the foreign language were either faced with a Czech (familiarized foreign) or a Swedish (non-familiar novel language) speaking model. The results show that children were just as likely to imitate the foreign language speaking model as the native model if they had previously been familiarized with the language. A low imitation rate in the Czech-Swedish condition suggests that the effect was restricted to the familiarized language and that familiarization did not result in a general acceptance of teachers speaking in foreign languages.

Other Scientific achievements in relation to the project

We initiated and edited a Research Topic and an E-book under the same title in the field of the research project at *Frontiers*.

Király I és Buttelmann, D. (2016) (guest editors) *Frontiers in Developmental Psychology*, Research Topic on "Learning in social context: the nature and profit of living in groups for development

We organized as guest organizers (Oláh Katalin and Ildikó Király) an international conference in the field of the research project.

DUCOG 2017 - Intuitive Sociologists: Representing Social Relations and Social Categories

http://www.cecog.eu/ducog/page_invitation.php

Summary

This research has contributed to the understanding of the epistemic function of social category formation by supporting the following conclusions. Children use specific cues, like convention and language to understand group cohesion. Crucially, children preferentially form social categories based on those behavioral cues that imply cultural knowledgeability. Once they figured out who is in-group and who is out-group, they attend, act and learn selectively from individuals who have been categorized as culturally knowledgeable. Yet, the basis of this mechanism seems to be available for the socialized adult mind as well.

Additionally, we have provided evidence that both adults and children are able to access the content of an interactional partner's level-2 perspective online and without instruction to do so. These findings suggest that having prior information about the partner's attentional focus plays a role in this online effect, probably through narrowing down the circle of to-be-represented perspective content. This ability may contribute to humans' capacity to detect the dynamic aspects of knowledge and pinpoint any possible representational differences between interaction partners who, on a larger scale (e.g. through cultural group membership) may still share a representational space.

Significance of the research

In our view, the significance of the output of this project is multifaceted. On the one hand it has deepened our knowledge about the cognitive bases of the early available, ubiquitous process of social category formation. In contrast to current dominant explanatory theories emphasizing that social category formation is simply rooted in humans' need to belong and affiliate with a group, we provided evidence that both children and adults use cues of shared knowledge to sort partners as group members, and this mechanism serves a cognitive, epistemic function of identifying culturally knowledgeable individuals for acquiring and exchanging knowledge (in addition to its affiliative role). On the other hand, we investigated the functional characteristics of the mechanisms that allow tracking other people's knowledge and mental states on-line, during social interactions. We suggest that this competence leads to identifying the optimal actual shared representational space.

Practical Significance of the research

Understanding the basic cognitive mechanisms shaping social category representations is not only vital for scientific progress, but may also provide essential information for developing programs aimed to reduce stereotypes, prejudice and violent behaviour towards out-group members. As leaders all over the world face the challenge of integrating people from different cultural backgrounds into one society, it becomes more and more pressing to target the core processes that shape people's thinking and attitudes toward different cultural groups. Our proposition regarding the importance of the perception of shared cultural knowledge in categorization resonates well with current debates about the so-called „immigration crisis”.

Moreover, social psychologists have long realized the connection between reasoning about fellow humans' mental states and categorization in describing the phenomenon of „dehumanization” (see Haslam, 2006). The term refers to the phenomenon of depriving out-group members of human sentiments and thoughts and is probably crucial in legitimizing violent actions towards out-group members. In our view, this phenomenon is not simply the consequence of categorization processes but actually contributes to the formation of category representations (i.e. people judge someone as out-group if there is a mismatch between the knowledge base they possess, thus monitoring the mental states of them requires more effort and is more likely to result in failure). Exploring these connections between the cognitive processes of social categorization and theory of mind may allow for intervention programs to target the very core of the processes that lead to hostility towards out-group members.

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