Assessing the Effect of Culture on Theory of Mind Performance in South African Students

Margaret Mc Grath
ACSENT Laboratory
Department of Psychology
University of Cape Town

Supervisor: Susan Malcolm-Smith

Word Count:

Abstract: [153]

Main Body: [9959]

ABSTRACT

Theory of mind (TOM) is the ability to infer another person's beliefs, desires and feelings. TOM is believed to be a universal ability. However research has indicated differences in TOM development across cultures. South Africa provides a unique opportunity to research the effect of culture on adult TOM performance. In this study data was collected on three culture groups: English, Afrikaans and Sotho/Tswana cultures. The participants were tested on the three tasks most commonly used in adult TOM research: Strange Stories, Reading the Mind in the Eyes and Faux Pas. The results of this study indicate that culture does not impact on performance on the Strange Stories, Reading the Mind in the Eyes and Faux Pas, supporting the hypothesis that TOM is uniform across cultures. However the sample used was highly educated so these results should be generalized cautiously. The results also indicate that features of the tasks are biased for non-English cultures.

Keywords: Theory of Mind; Students; Culture; Reading the Mind in the Eyes; Faux Pas; Strange Stories

You see a man running after a bus; automatically you assume that the man wanted to get on the bus. A boy tells a lunch lady that he will not get supper that night, to invoke sympathy in her and get more lunch. Every day people make inferences about other people's beliefs, feelings and intentions. Being able to infer what people are thinking and feeling from their behavior and the converse – the ability to predict how they will react in situations based on their feelings and thoughts – is essential for navigating the social world. The ability to infer what another person is thinking or feeling is referred to as theory of mind (TOM). Developmental studies with children all over the world suggest that TOM is a universal ability. However, this research also indicates that socio-cultural factors can impact TOM performance. South Africa provides a unique opportunity to examine the effects of language and culture on TOM performance. Additionally, as South Africa is so culturally diverse, it is important assess how appropriate the standard TOM tasks are for future research and interventions targeting TOM in South Africa.

LITERATURE REVIEW

What is Theory of Mind?

In their seminal paper Premack and Woodruff (1978) defined TOM as the ability to ascribe mental states to oneself and others, and thus the ability to infer what other people believe in a situation, and how they will act. The term 'mental states' includes references to beliefs, desires and feelings. The word 'theory' is used because mental states are not observable, and thus knowledge of them is theoretical. Additionally, like a scientific theory, TOM can be used to predict and explain behaviour (Lillard, 1999).

Much research has been conducted into how and when TOM arises. Studies have used various tasks to investigate children's developing understanding of desires, beliefs, emotions, belief-desire reasoning and psychological explanations. The traditional test of TOM has been the false belief task (Baron-Cohen, Leslie & Frith, 1985). This tests if the child can make interferences about someone's behaviour based on the person's false belief. The false belief test has been the gold standard for TOM studies, because it clearly shows that the participant is making a decision based on someone else's internal beliefs and not on reality (Wellman, Cross, & Watson, 2001).

An example of a false belief task is the Sally-Anne scenario. In the scenario, there are two doll protagonists, Sally and Anne. Sally places a marble in a basket and then leaves the scene. Then Anne moves the marble and puts in a box. The participant is asked 'where will Sally look for the marble?' If the participant answers that Sally will look in the basket, they

have successfully predicted someone else's behaviour based on their belief. Because the prediction is dependent on correctly inferring that person's false belief, the task empirically shows TOM ability (Baron-Cohen, Leslie, & Frith, 1985).

Most 3-year-olds consistently fail this task, and answer incorrectly at below chance rates. By age four most children are able to correctly conceive of someone else having a false belief. This supports the hypothesis that around age four children's TOM undergoes a major conceptual shift, from a situation-based to a representation-based understanding of behaviour (Wellman et al., 2001).

Current research indicates that TOM deficits are present in a wide range of clinical populations. A common symptom of Schizophrenia is attributing one's thoughts and actions to outside control. This could be the result of TOM deficits as the patient is unable to attribute mental states to themselves (Corcoran & Frith, 2005). Patients who have sustained right frontal damage are impaired on a number of TOM tasks, for instance the appreciation of second-order mental states (having a belief about someone else's belief) (Happé, Brownwell, & Winner, 1999). Patients with frontotemporal dementia, which is characterised by changes in personality and social behaviour, perform significantly worse on all TOM tasks compared to patients with Alzheimer's dementia (Brune & Brune-Cohrs, 2006).

To adequately research clinical populations we need appropriate TOM tasks. However adults pass false-belief tasks consistently thus it is not an appropriate task to use when investigating adult TOM. Tasks for investigating adult TOM have been developed overseas. However research by Susan Malcolm-Smith on TOM deficits on patients with right hemisphere damage found that the controls recruited also exhibited deficits in TOM reasoning. This suggests that the TOM measures used were not appropriate for the South African context and need to be modified (S. Malcolm-Smith, private communication, May 19, 2009).

Testing across Cultures

Neuropsychological abilities such as intelligence and executive function may be consistent across cultures. However the majority of these tasks have cultural and racial biases (Helms, 1992). It is well known that participants who are white, middle class and native English speaking perform better on psychological assessments than participants from other cultures (Brickman, Cabo, & Manly, 2006). While this study will investigate whether TOM is a consistent ability across cultures, it will also examine whether features of the tasks are biased towards non-English participants.

Numerous aspects of culture and ethnicity affect performance variance. One aspect is acculturation - the extent to which participants have adopted the beliefs, values and practices of the host culture impacts on their performance. The more assimilated the participant is, the better they tend to perform on neuropsychological tests. Different languages and differences in skill of language between the tester and the participant can also have a large affect on test performance. When tests are not adequately translated or adapted it also biases the participant's performance. All ethnic and cultural groups have specific differences that make them unique. It is often hard to be aware of these differences. Researchers and clinicians need to be sensitive to potential sources of cultural bias for better test interpretation (Suzuki, Ponterotto, & Meller, 2001). There are many cultures in South Africa, so particular care needs to be taken to ensure neuropsychological tests are fair to all concerned. TOM may be a universal ability, but many adult TOM tasks involve culturally bound stories. Consequently the tasks may not be an adequate reflection of TOM ability.

Evidence for Universal TOM

The strongest evidence for universal TOM comes from the many studies done on the development of false-beliefs in children. Studies have found consistent data for the onset, trajectory and performance of false-belief tasks in children.

Wellman et al. (2001) conducted a meta-analysis comparing false-belief performance across age, task differences and countries. They concluded that there is a main effect for age – children improve on false-belief tasks as they get older, and the trajectory of false-belief performance is the same. However children in different countries show varying onset times. A recent meta-analysis of false-belief reasoning in children in North America and China confirmed this by showing a similar trajectory for false-belief development. But children's successful false-belief performance varied by as much as two years between different locales (Liu, Wellman, Tardif and Sabbagh, 2008).

Naito and Koyama (2006) found Japanese children showed a delay in false-belief performance compared to their British counterparts. Additionally they showed that provincial Japanese children were more delayed than their urban counterparts: in Japanese provinces, children only passed false-belief tasks at 6-7 years old compared to the four or five for urban children. Chasiotis et al. (2006) found that children from Germany and Costa Rica performed similarly to children from America on false-belief tasks. However children from Cameroon were delayed in their onset of false-belief attribution. Callaghan et al. (2005) tested children from five different cultures (Canada, Samoa, India, Peru, and Thailand) on

one false-belief task. They concluded that there is a universal age of onset around the age of five years which is consistent with samples from British children

Differences in TOM Ability

While these studies clearly showed that TOM was a universal ability, all the children passed the false-belief tasks. They also showed that there is variability in TOM performance that needs to be accounted for. Various factors have been raised to account for the variance in TOM performance. Cognitive factors such as executive function and verbal intelligence, and social-cultural factors such as language, family size and parenting style have all been suggested (Chasiotis et al., 2006; Hughes & Leekam, 2004; Liu et al., 2008; Watson, Painter & Bornstein, 2001; Wellman et al., 2001).

Performance on any cognitive task reflects at least two factors: the conceptual understanding required to solve the problem and other non-focal cognitive skills. For example, performance on a false belief task relies on the child having the necessary conceptual understanding to represent people's mental states. But it also requires the ability to remember key information, focus attention, comprehend and answer questions. Studies have shown a correlation between executive functioning and TOM ability, and some researchers have argued the false belief tasks are actually measuring children's growing competence at executive functioning. Thus it is necessary to have a measure of executive function (Wellman et al., 2001).

Watson et al. (2001) found that variances in verbal intelligence predicted differences in false-belief performance. This suggests that verbal intelligence needs to be taken into account when measuring TOM.

Various social-cultural factors, mainly revolving around language and conversation, have also been suggested to explain variance in TOM performance. For example, children whose families talk about emotions more often have a more sophisticated understanding of belief and false belief at 4 years of age (Hughes & Leekam, 2004). While late-signing deaf children who rarely engage in conversation struggle on false belief tasks (Peterson & Siegal, 1998).

Language itself can affect TOM performance. For example, in Chinese the word 'think' can be neutral in respect to its truthfulness or it can denote a false belief. Chinese children's performance significantly improved when the 'think falsely' word was used compared to the neutral word (Liu et al., 2008).

Children from larger families typically show accelerated false-belief comprehension (Perner, Ruffman, & Leekman, 1994). It is believed that large families provide more interaction needed for developing TOM. This factor could potentially be very interesting in this study as African cultures normally have larger families and are more collectivist. Larger families also give more opportunity for joint pretend play. Amount of joint play has been shown to be correlated with more sophisticated understanding of mental states. It has been suggested that pretend play helps children conceptualize other people having mental states. However, as this data is correlational no causal inferences can be drawn (Youngblade & Dunn, 1995).

Chasiotis et al. (2006) argued that authoritarian parenting style may result in less conversation, thus inhibiting TOM development and accounting for Cameroonian children's delayed performance. However other studies have suggested that increased inhibition skills are correlated with better performance on false-belief tasks (Wellman et al., 2001).

Researchers have come to the conclusion that children and adults have a universal ability to reason using beliefs and emotions. However cultures vary in the way these mental states are conceived. For example children in all cultures can distinguish between a dream event and a real event. However they may disagree on the status of the dream event: some cultures take dreams to represent emotional conflicts, while others see dreams as warnings of future events. (Avis & Harris, 1991, Callaghan et al. 2005). There is a need to examine whether these differences impact on TOM performance as adults.

Two Models of TOM

Modular Theory

The false-belief paradigm as produced two strands of evidence. The first details how all children develop the ability to understand false-beliefs, and the second shows how socio-cultural factors can impact this false-belief understanding. Two mechanisms have been developed from both false-belief and other sources of information. The mechanisms said to underlie TOM are modular theory and 'theory' theory (Lillard, 1998).

Modular theory proposes that because children can become competent reasoners of mental states even though they cannot touch, see, or hear them, there must be some innate ability that allows TOM to develop. Modular theorists argue that this innate ability takes the form of a specific TOM module. A neural module is essentially an information processing unit. It takes lower order inputs and transforms them in higher level outputs (Scholl & Leslie, 1999).

Modules have certain characteristics: they are closed systems, they do not use information outside of the module and only the output of the module is available to the central system. Modules only process specific types of information, which they process automatically. Additionally this processing is rapid; no doubt a result of only processing select information. This speed and automaticity seems to be consistent with TOM performance: most of the time we automatically and quickly infer someone's mental state (Scholl & Leslie, 1999). For example consider the following scenario a burglar has just robbed a shop and in running away. A policeman sees he has dropped his glove and calls out for him to stop. The burglar immediately stops and gives himself up. Why does the burglar do this? We automatically realise that the burglar thinks the policemen is trying to catch him for the robbery, not to give back his glove (Happé, 1994).

Additionally, modules can be selectively impaired by neurological damage. For example a lack of TOM ability is proposed to explain the behaviours seen in autism. Children with autism are characterised by impairments in communication, socialization and imagination (Wing & Gould, 1979). Children with high functioning autism are able to reason competently about physical phenomena but often fail false-belief tasks, while children with William's syndrome have intact social functioning but impaired intelligence (Baron-Cohen et al., 1985).

Modular theorists argue that TOM development depends on the neurological maturation of the brain structures involved. Thus modular theorists argue that environmental factors such as language or socio-economic status may affect the time frame in which the TOM module develops but that the final manifestation of TOM is consistent across cultures. Essentially modular theorists argue that children develop uniform beliefs about mental states across cultures. However beliefs about mental states, is a very basic building block of TOM. It is possible that mature TOM abilities seen in adults may well interact with other cognitive processes and thus may not be uniform across cultures (Scholl & Leslie, 1999).

'Theory' Theory

'Theory' theory, proposes that people develop theory of mind by developing a theory-like body of knowledge about minds. This body of knowledge consists of causal or explanatory laws that relate external stimuli to mental states (Lillard, 1999). This knowledge is learnt much like any other type of scientific knowledge. In the 'theory' theory model social experiences help form the child's conception of others and inform their knowledge base. 'Theory' theorists predict that differences in the cultural environment will lead to

differences in how specific mental states are understood (Hughes & Leekam, 2004). Gopnik (1996) uses the analogy of Neurath's boat to explain how TOM develops in adulthood. You set sail in a ship (TOM) that you are continuously rebuilding. No change at one time can be large enough to threaten the seaworthiness of the ship. Yet by the end of journey there may be no plank that was in the original structure.

If modular theory is correct, TOM is uniform across cultures. If this is so TOM tasks developed overseas can be used in South Africa. But if culture does play a role in adult TOM it would not be appropriate to use TOM tasks developed within other cultural contexts. Examining the performance of students from different cultures on TOM tasks will be a first step in assessing whether TOM performance is consistent or diverse across cultures. To our knowledge there is no other work comparing adult TOM cross culturally.

RATIONALE FOR RESEARCH

The majority of TOM research has investigated children's false belief reasoning. This research shows that there is a universal ability for false belief reasoning. However, false belief reasoning is not the entirety of TOM. Adult TOM may be far more intricate and culturally diverse. South Africa provides a unique opportunity to compare the effect different cultures have on TOM performance, and to see whether adult TOM is a measurably universal ability or if it is culturally specific. Presently there is no information on South Africans' performance on adult TOM tasks, so this research will begin to fill this knowledge gap. The present tasks used for measuring TOM in adults have all been developed in Western countries. It is important to assess whether these tasks are appropriate for the South African environment.

Since TOM is beginning to be investigated in clinical populations it is vital to know how appropriate the standard tasks are in measuring TOM in normal adults. Students provide a good population to start investigating TOM performance in South Africans, as they are an easily accessible normal population.

Students are also a good population to start with, as given their education level factors such as English language proficiency and socio-economic status will have less effect on their performance than more disadvantaged populations. This hopefully allowed us to isolate the effect of culture. It was also our hope that students while having experience with Western social norms would also be familiar with their own cultures norms and would be able to point out instances which would be problematic in their culture.

SPECIFIC AIMS AND HYPOTHESES

The specific aim of this research was to begin to investigate how South African students from different cultures perform on TOM tasks. Does a student's culture make a significant difference to their TOM performance? I.e. is adult TOM ability consistent or diverse across cultures? And did the tasks have cultural features that would bias non-English participants?

There were no specific hypotheses, as there was no previous research published on this topic. The English participants were expected to be most familiar with the cultural terms in the tasks, and thus to have the highest TOM scores. We were unsure what to expect from the non-English participants. In addition to quantitative group comparisons, qualitative data about perceptions around the test items were collected. This latter data was to help us assess how appropriate the tasks were to South African cultures, and to find what particular aspects of the tasks the students struggled with and what could be modified to make the tasks less biased.

METHODS

Design

The research used a quasi-experimental study to compare different cultural groups. The independent variable was culture. Data was collected from 3 groups: English, Afrikaans, and Sotho/Tswana home language speakers[1]. The dependent variable was TOM performance. In addition the covariates executive function and IQ were measured.

The dependent variable, TOM performance, was measured by three TOM tasks: Strange Stories (Happé, 1994), Reading the Mind in the Eyes (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997), and Faux Pas stories (Stone, Baron-Cohen, Knight, 1998). These three are the main tasks used for research on TOM in adults. IQ was measured using the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). Executive function was measured using the Delis Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001). To prevent order effects the study was counterbalanced with half the participants receiving the TOM tasks first and half the WASI and D-KEFS. All testing took place in the UCT's Department of Psychology. Participants were tested in a quiet room free from distractions.

Participants

In total 67 participants were recruited primarily from the undergraduate psychology students who must partake in the Student Research Participant Programme (SRPP) for Duly Performed requirements. The students were divided into three language groups: English (n = 36), Afrikaans (n = 19), and Sotho/Tswana (n = 12). Home language was used as proxy for culture as it was not ethically acceptable to recruit using race. These language groupings encompass some of the main cultures in South Africa. Since Sotho and Tswana are linguistically and culturally similar they were placed in one group. The ideal would have been to consider each ethnic group separately, but this study only constitutes an initial analysis of cultural TOM differences and is constrained by the limited scope of an honours level research project.

Students had to speak one of the chosen languages as a home language to qualify for that group. The only other selection criterion was that the participants had to be South African citizens or come from the Southern African Development Community (SADC) region.

[1] This study is part of a larger research group which is also investigating Xhosa and Zulu cultures

Ethical Considerations

This study has been approved by the Department of Psychology's Research Ethics Committee (reference number: 2008007). There were few potential ethical problems in this project. As the students were only being asked to perform a series of pen and paper tasks, they were under little psychological and no physical risk. One general issue was confidentiality. The students' confidentiality was safeguarded by assigning each participant a code by which they were identified. All the data was securely stored, and only accessed by researchers directly involved with this project.

Additionally there was an ethical concern in administering the WASI (Wechsler, 1999) and D-KEFS (Delis et al., 2001) to populations that the tests had not been standardized fore. Nevertheless the study required some measurement of these abilities and the WASI and D-KEFS are two well accepted and reliable tests. We are aware of the inherent bias psychological tests have for participants of different cultures and so we used the scores with caution (Manly, 2008). These tests were only included to control for confounding variables and not for any diagnostic purposes. Given the biased nature of the scores we did not reveal the participant's scores to them.

All participants were given a consent form informing them of their rights. The consent form explained the purpose and aims of the study, and outlined the participants' rights to confidentiality and to withdraw from the study at any point in time. The students were told they could contact us if they had any questions about the study and their role in it (see appendix A). Students benefited from participating in the study by being awarded SRPP points needed for their duly performed certificate. Debriefing was short because there was no deception involved in the study. At the beginning of each session the participant was fully informed that the purpose of the study was to examine TOM performance in South African students. The students were asked whether they had any questions about the study after they had finished. All students were given an email address associated with the study, to contact us with, if they had any further questions or concerns.

Materials

Strange Stories

Strange Stories compared performance on eight stories requiring the participant to make an inference based on mental states (referred to below as TOM strange stories) and eight stories requiring a physical inference (referred to below as control strange stories). The participant

was given a story to read and then asked why something had happened. This task assesses TOM ability because the participant had to explain someone's behaviour according to their beliefs, desires and feelings. Importantly this task had controls built into it: the physical inference stories. Thus if a person failed on the TOM stories and performed well on the physical control stories we know there was a genuine TOM deficit and not a deficit in general inference making (Happé, 1994).

Reading the Mind in the Eyes

In this task participants were shown photographs that showed the eye region of a person's face. The participants were asked to choose which among four words best described the emotion of the person in the picture. The number of emotions correctly recognised is referred to below as Reading the Mind in the Eyes

This task was developed because once children reached the age of six years they attain ceiling effects on the gold standard false-belief task. This test was developed by Baron Cohen et al. (1997) to measure adult TOM. In the study a group of normal adult controls was compared to a group of adults with autism (autism is characterised by deficits in TOM). Relative to the normal control group, the group with autism was significantly impaired on this task. In contrast the autism group was unimpaired on two control tasks: recognising gender from the eye region of the face and recognising emotions from the whole face. Thus this test, which involves inferring a person's mental state just from their eyes, is a more appropriate measure for subtle TOM ability in adults. This test is assumed to be a pure measure of TOM as it involves no executive function component.

Since this task used a high level of vocabulary, which is not used in everyday language, all participants were given a glossary to look up words unknown to them. We wanted to see whether this vocabulary level produced difficulties for non-English participants. To do this we noted the number of times the participants looked up words in the glossary, this is referred to below as *number of words looked up*.

Faux Pas Stories

A faux pas occurs when someone says something they should not have said, not knowing or not realising they should not have said it. To understand a faux pas the participant had to conceptualise two mental states. Firstly, that the person who said the faux pas did not realise they should not have said it, and secondly, that the person hearing it would feel insulted or hurt. Thus there is both a cognitive and an affective component to the task.

Participants were asked whether someone had said something they should not have said or something awkward. If they answered yes it showed that they could detect the faux pas. Below the participant's score on this task is referred to as faux pas TOM. The participants were then asked a series of questions to test their understanding of the faux pas. To test whether they understood the faux pas, they were asked who had said something they should not have said. Then they were asked why they should not have said it to test their understanding of the mental state of the listener. To test their understanding of the mental state of the speaker they were asked why the speaker had said it. The scores to these questions were summed and below are referred to as faux pas understanding.

In addition to the ten faux pas stories, there were ten control stories that did not contain a faux pas. These were used to check that the participants were not just saying yes to every question and could differentiate between awkward and normal situations. Below this variable is referred to as faux pas control stories.

Regardless of whether the faux pas was recognized or not the participant was asked control questions. These were basic questions about the story that required no interpretation. For example, 'what got spilt on the dress?' These questions checked whether or not the participant understood the story (Stone et al., 1998). These are referred to below as faux pas control questions.

Qualitative Questionnaire

The qualitative questionnaire (see Appendix B) is a general questionnaire to get feedback from the participant. This questionnaire provided a basis for probing a participant's reactions to the TOM tasks. The questions were designed to find out whether the participant understood what had been required of them in the tasks, and whether the tasks were culturally appropriate.

Verbal Intelligence Test - WASI

It has been argued that differences in TOM ability can be attributed to differences in verbal intelligence. Thus a measure of verbal intelligence had to be taken to ensure that the groups were equal on this measure. The WASI (Wechsler, 1999) is a well accepted measure of intelligence. It consists of four subtests and gives an assessment of verbal, performance and full scale IQ. In this case only the verbal IQ score was used, as it is the most relevant theoretically. The WASI has been standardized and normed for individuals between the ages of 6 and 89 years. Although the WASI has not been normed for the South African population,

there is no other well normed test for South Africa, so it is the best measure available. All such tests need to be used carefully because levels of education and acculturation significantly affect performance (Shuttleworth-Edwards et al., 2004).

Executive Function Test Battery – D-KEFS

Differences in TOM ability have also been attributed to executive functioning ability. So an executive functioning test was administered to ensure that the participants were equivalent on this measure. The D-KEFS has been standardized and normed for populations between the age of 8 and 89 years, and has a high content validity for assessing executive function. The participants were administered the Stroop test. The Stroop test gives a measure of inhibition and cognitive flexibility (Delis et al., 2001). Both inhibition and cognitive flexibility have been associated with TOM (Wellman et al., 2001)

Procedure

At the start of each assessment, the participant was given a consent form to sign. The consent form explained the study's purpose, what the participant was expected to do in the study, and the rights of the participant to confidentiality and to withdraw from the study at any time (see Appendix A). The participant was asked whether they had any questions about the study. To avoid order effects half the participants started with the TOM tasks and the other half with the WASI and D-KEFS.

The TOM section started with the Strange Stories task (Happé, 1994). The participant was told to read the story and when they understood it, to turn the page and answer the question. Because of limited time and the assumption that university students should not have memory or reading impairments the participants were not asked to read the story aloud.

The Reading the Mind in the Eyes task (Baron-Cohen et al., 1997) was administered next. The student was asked to choose the word that best described the emotion of the person in the photograph. The participant was given a glossary of the words and told they could look up any words they were unsure of.

The participant was then asked to read the Faux Pas stories (Stone et al., 1998). After they had read each story the participants were asked whether anyone had said something they should not have said or something awkward. If they answered 'no' the participants were asked control questions to ensure they had understood the details of the story. If the participants said 'yes', they were asked the catalogue of questions, described above, to analyse their understanding of the faux pas, as well as the control questions.

When the participants had finished the TOM tasks they were asked the qualitative questionnaire. This questionnaire probed the participants' reactions to the TOM tasks. It took approximately an hour to administer this section to a single participant.

Then the WASI and the D-KEFS tasks were administered according to the standard instructions. This section took approximately another hour to administer. Finally, the participant was thanked for their participation in our project, and told they could contact us at any point if they had any questions about the study and their role in it.

Data Analysis

The main analysis was a comparison of the different culture groups. The aim of the project is to see whether culture makes a significant difference to TOM performance on the three different TOM tasks. Strange Stories and Faux Pas both have control stories so mixed factorial ANOVAs were performed on them. A one-way ANOVA was done to see whether the culture groups differ on the Reading the Mind in the Eyes task. Descriptive statistics of the subject variables are included. The participants' responses on the qualitative questionnaire were examined. We also reported our own observations on the participants' performance

The effects of verbal intelligence and executive function on TOM ability were also examined. TOM is theorized as a separate construct from IQ. For this reason, an ANCOVA was performed to see whether there was a difference between the culture groups when IQ and executive function had been partialled out.

RESULTS

The aim of this study is to investigate whether culture has a significant effect on TOM performance. Modular theory indicates that TOM is an innate universal ability and as such culture should not have an effect on TOM ability. However 'theory' theorists posit that we gain a body of knowledge that allows us to make social inferences. This body of knowledge is gained from social experiences. Thus cultural background could produce culturally specific TOM. In addition, it is well known that taking a test in one's second language can bias the results and hence part of the study investigates how to modify the tests for non-English South Africans. The following section contains the results of the statistical analysis mentioned earlier, in data analysis. These analyses compare the effect culture had on performance on the different TOM tasks.

Descriptive Statistics

Sex

In the study there were three groups divided according to culture of the students: English, Afrikaans and Sotho/Tswana. The undergraduate psychology demography is made up of mostly females. Despite this the Afrikaans and Sotho/Tswana groups had a number of male students while the English group only had one male participant (see Table 1). This is of concern as the literature suggests that females perform better at empathetic tasks (Rueckert & Naybar, 2008). Thus the English group as a whole may perform better not only because the participants within in it are doing the test in their home language but has because they are largely female.

Table 1

Number and Percentage of Females and Males in Culture Groups

	English	Afrikaans	Sotho/Tswana	Total
Female	35 (97.22%)	14 (73.68%)	8 (66.67%)	57 (85.07%)
Male	1 (2.78%)	5 (26.32%)	4 (33.33)	10 (14.93%)

Age

The groups were dissimilar in terms of age (see Table 2). However this is not of concern as there is nothing in the literature to suggest that age is a significant factor in explaining differences in young adult TOM. Age differences appear at the ends of the spectrum, for example the very young and the very old show difference in TOM ability (Apperly, Samson, & Humphreys, 2009). In adult TOM it is not age itself which is the issue but the social environment that an age group experiences. People from different generations can have vastly different life and social experiences. Consider children schooled pre- and post- apartheid. These different experiences can affect TOM performance. The participants in this study all fall within an eight year range, so they would have grown up in the same time period. Thus age is not a useful variable to explain cultural differences in this study.

Table 2

Number of Participants divided by Age and Culture

Age	English	Afrikaans	Sotho/Tswana	Total
18-20	31 (86.11%)	12 (63.16%)	4 (33.33%)	47 (70.15%)
21-23	4 (11.11%)	6 (33.58%)	5 (41.67%)	15 (22.39%)
24-26	1 (2.78%)	1 (5.26%)	3 (25%)	5 (7.46%)

Note. Percentage in brackets

Verbal Intelligence

The groups differed on their verbal intelligence as measured by the WASI VIQ scale (see Table 3). While these groups differ it is important to note that they nonetheless fall within the normal range of intelligence. Thus all of the participants have the necessary capabilities to complete the TOM tasks. However since a one-way ANOVA showed a significant difference between the cultures ($F_{(2,64)} = 4.42$, $p = .016$) the effects of verbal intelligence need to be statistically controlled for.

Table 3

Verbal Intelligence (measured by WASI) Across Culture Groups

	English	Afrikaans	Sotho/Tswana	Total
Mean	114.83	111.16	105.50	112.12
Standard Deviation	9.29	10.79	8.28	10.05

Executive Function

Inhibition scores (measured by inhibition vs. colour naming) and cognitive flexibility scores (measured by switching vs. inhibition) (Delis et al., 2001) were similar for all the groups (see Table 4). Additionally all the groups fall within the average range. Thus all the participants have the necessary capabilities to complete the tasks. As there was not a significant difference between the groups on inhibition ($F_{(2,.64)} = 1.08$, $p = .346$) or cognitive flexibility ($F_{(2,64)} = 0.18$, $p = .840$) these variables were not controlled for statistically.

Table 4

Mean Executive Function Scores (measured by DKEFs Stroop test) Across Culture Groups

	English	Afrikaans	Sotho/Tswana
Inhibition vs. colour naming	11.28 (1.89)	10.74 (2.28)	11.83 (2.12)
Switching vs. inhibition	10.03 (1.95)	10.42 (2.06)	10.17 (3.59)

Note. Standard deviation in brackets

Strange Stories

Mixed Factorial ANOVA

A mixed factorial ANOVA[2] was performed. The between groups independent variable was culture, it has three levels: *English, Afrikaans* and *Sotho/Tswana*. The within groups independent variable was story type. It has two levels: *TOM strange stories*, which require inferences about people's mental states, and *control strange stories* which require physical inferences.

There was not a significant interaction effect ($F_{(2,64)} = 0.83$, $p = .440$). Thus the main effects can be interpreted freely. Story type had a significant effect ($F_{(2,64)} = 26.93$, $p < .001$, $\eta^2 = 0.08$). The means show that all participants performed significantly better on the *TOM strange stories* (M = 13.38, SD[3] = 0.28) than on the *control strange stories* (M = 11.91, SD = 0.27).

Culture had a significant effect ($F_{(2,64)} = 4.15$, $p = .020$, $\eta^2 = 0.09$). Tukey's post hoc test showed that the *English* group (M = 13.49, SD = 0.29) scored significantly better on both types of stories than the *Sotho/Tswana* group (M = 12.00, SD = 0.51, p = .014).

Controlling for verbal intelligence

The culture groups differed on verbal IQ scores, so an ANCOVA was done to remove any confounding effects. In the ANCOVA *culture* no longer had a significant effect on strange stories performance ($F_{(4,124)} = 1.33$, $p = .261$). However verbal intelligence did have a significant effect ($F_{(2,62)} = 5.48$, $p = .006$). This indicates that verbal intelligence explains more of the variance in the scores than culture for the both strange stories tasks.

[2] All assumptions of analyses met, unless otherwise stated.
[3] M = Mean, SD = Standard Deviation

Reading the mind in the eyes

A one-way ANOVA with *culture* as the independent variable and number of emotions correctly assigned to eyes as the dependent variable was done. There was not a significant effect for the reading the mind in the eyes task ($F_{(2,64)} = 1.04$, $p = .359$). This means that performance of the culture groups did not differ significantly on this task. Additionally an ANCOVA controlling for verbal intelligence did not make a difference to the effect of culture ($F_{(2,64)} = 0.98$, $p = .380$)

A one-way ANOVA with *culture* as the independent variable and *number of words looked up* as the dependent variable was done. There was a significant effect for the number of words the participants looked up ($F_{(2,64)} = 11.783$, $p = .00004$, $\eta^2 = 0.27$). Tukey's post hoc test showed that there was a significant difference between the Sotho/Tswana group (M = 7.42, SD = 4.81) and the English group (M = 2.31, SD = 2.94, $p = .0001$), and between the Sotho/Tswana group and the Afrikaans group (M = 2.89, SD = 2.49, $p = .001$).

Faux Pas Stories

The *faux pas* task is designed to test participants' understanding of awkward social situations. There are four measures: faux pas stories TOM, faux pas understanding, faux pas control stories and control questions

Mixed Factorial ANOVA

A mixed factorial ANOVA was done with story type as the within groups variable. Story type consists of two levels: *TOM stories* containing a faux pas and *control stories* which did not. The between groups independent variable was culture which had three levels: *English, Afrikaans* and *Sotho/Tswana*.

There was not a significant interaction effect between story type and language ($F_{(1,64)} = 0.18$, $p = .836$) so the main effects can be interpreted freely. Culture did not have a significant main effect on faux pas performance ($F_{(2,64)} = 1.76$, $p = .180$). There was a significant main effect for story type ($F_{(1,64)} = 9.73$, $p = .003$, $\eta^2 = 0.06$). A comparison of the means indicates that all the participants performed better on the *TOM stories* (M = 9.56, SD = 0.11) than the *control stories* (M = 8.92, SD = 0.18).

When an ANCOVA was done to control for verbal intelligence it did not make a meaningful difference to the ANOVA result – *culture* still did not have a significant effect of faux pas performance ($F_{(4,124)} = 0.89$, $p = .475$)

A one-way ANOVA using *faux pas understanding* (i.e. the total scored on the questions probing understanding of the Faux Pas) as the dependent variable and *culture* as the independent was done. The results indicate that *culture* does have a significant effect on *faux pas understanding* ($F_{(2,64)} = 6.37$, $p = .003$, $\eta^2 = 0.17$). Tukey's post hoc revealed that there was a significant difference between *English* (M = 51.42, SD = 6.24) and *Sotho/Tswana* (M = 44.5, SD = 5.85, $p = .001$).

A one-way ANOVA using *faux pas control questions* as the dependent variable and *culture* as the independent variable was done. The results indicate that culture does not have a significant effect on the control question scores ($F_{(2.64)} = 1.10$, $p = .353$). (Note that control questions violated the assumption of homogeneity ($F_{(2,64)} = 7.31$, $p = .001$). All the groups performed well on this variable – the majority of participants answered all the questions correctly (see Table 5).

Table 5

Mean and Standard Deviation of Control Questions

	English	Afrikaans	Sotho/Tswana
Mean	39.72	40.00	39.67
Standard Deviation	0.97	0.00	0.49

Note. Control questions scored out of a maximum of 40

DISCUSSION

The results tentatively indicate that TOM is consistent across cultures, but features of the tasks such as culturally specific knowledge and vocabulary does bias the scores of non-English participants. This section discusses the results of each TOM task separately.

Strange Stories Task

Differences between Story Types

The results showed that all the participants performed significantly better on the TOM stories than the physical control stories. This is unusual as the control stories are supposed to be easier than the TOM stories. The control stories' purpose is to ensure that the participant does not have a general deficit in making inferences – indeed Happé (1994) found that control participants did better on the TOM stories.

This result may be explained by to the type of knowledge required to answer the different stories correctly. The TOM stories required the participants to make inferences about the characters' mental states. The participants seemed to be able to understand these mental states in most of the stories. For example one of the TOM stories involves an old women walking home in the dark. She is nervous because she is afraid of being robbed. A man approaches her wanting to ask the time. But as he nears she says, 'Take my purse, just don't hurt me please (Happé, 1994).' Participants were asked why she said this. The answer is she is afraid the man is going to attack and rob her. The mental states of this scenario are ones South Africans can relate to.

In contrast, to correctly make physical inferences for some of the control stories, knowledge about European culture is required. For instance, one of the physical control stories involves a man who makes mayonnaise. He then makes meringues even though he already has enough dessert. Participants are asked why he made the meringues (Happé, 1994). Participants who are unaware that mayonnaise uses only the yolks of eggs, while meringues only needs the egg whites struggled to make the appropriate inference here. Indeed some of the Sotho participants asked what meringues were.

In another control story a librarian receives a special book which she must catalogue and find an appropriate place for. This new book it about plants and their medicinal uses, and is heavily illustrated. However, the librarian does not put it on the shelf with the rest of the books on botany. Neither does she put it with the books on medicine. Instead she carefully takes it into a separated room. In this room all the books are kept in special cases, and the temperature is kept constant (Happé, 1994). Participants were asked why she did this. The correct answer is that the book is in a delicate condition. For someone who is unaware of how rare books are stored this story is very confusing. For instance some participant responses to this story, were that the librarian did not know were the book was supposed to be catalogued, or that there were real plants within the book.

Differences between the Culture Groups

The analysis also showed that the English group performed significantly better than the Sotho/Tswana group on the Strange Stories task. This can be explained by the fact that the English group is the closest in culture to the task's creators, so the participants in this group would have more of the cultural knowledge needed to answer the stories.

When verbal intelligence was controlled for statistically, there was no longer a significant effect for culture. Taking into account that the English group had the highest

verbal intelligence scores (see Table 3) this supports the previous explanation that the control strange stories are biased against non-English cultures because they require culturally specific knowledge – such as the ingredients for meringues. It is well known that tests of intelligence are culturally biased (Richardson, 2002). Indeed, many psychologists argue that intelligence tests are measures of cultural assimilation rather than intelligence. For example half of the WASI verbal intelligence scale is based on a vocabulary test, where participants are asked to define words of increasing difficulty. Thus the higher a participant's verbal intelligence score the higher their knowledge of English. Hence it is not surprising that the English participants had the highest verbal intelligence scores and the necessary cultural knowledge to perform the best on the control strange stories.

These results suggest that the TOM strange stories are appropriate for measuring the ability to assign mental states in highly educated South Africans. If the task is to have appropriate controls, the control stories will need to be changed to reflect more common South African knowledge. If future researchers do not what to entirely change the control stories, the stories can be changed to make the needed knowledge more explicit. For example, one story is about a longsighted woman who loses her glasses. During the day she goes to the gym, the post-office and the florist. When the women realises she has lost her glasses she goes to the post-office. Participants are asked why the post-office is the most likely place for her glasses to be (Happé, 1994). A correct answer is that the post-office is the most likely place for her to read something. However some participants were unclear about the meaning of 'longsighted' as it is unfamiliar to them. If the story was changed to say 'a woman needs glasses to read,' the necessary information is there for the participant to make the inference.

Reading the Mind in the Eyes Task

Baron-Cohen et al. (1996) argued that there exists a universal ability in humans to recognise mental states from faces. The result of this study's reading the mind in the eyes task upholds this hypothesis. There was not a significant effect for culture on the reading the mind in the eyes task.

Culture did not make a difference to performance on the reading the mind in the eyes task. This suggests that the reading the mind in the eyes task would be a good TOM task to use in a multi-cultural setting. Considering that these results are from a highly educated and fairly acculturated sample, more research should be done before they are applied to the wider population.

The Sotho/Tswana participants had to look up significantly more words than the other groups. This in itself is not problematic as all participants were given a glossary to look up any words they were uncertain of. Indeed the words used in the reading the mind in the eyes task are uncommon even to first language speakers e.g. tentative.

These results point to the fact that TOM ability and more specifically the ability to recognise mental states from visual stimuli, is a consistent ability across cultures. However features of the task – in this case the vocabulary required – introduce bias in the scores of the non-English participants.

Participant Comments on the Reading the Mind in the Eyes task

One Sotho participant said that he ascribed eye's emotion by thinking about how emotions are expressed in the movies. This could mean that the ability to recognise the emotions comes not from a universal ability to recognise mental states, but that the participants have learnt to read the task's mental states from their exposure to Western media. If this is the case it would be important to test the Reading the Mind in the Eyes task on participants with little exposure to Western media.

Faux Pas Task

The mixed factorial ANOVA did not show a significant main effect for culture. This would indicate that culture does not make a significant difference to the ability to recognize a faux pas. Controlling for verbal intelligence did not significantly affect the ANOVA – culture still did not have a significant affect on the stories. This supports the previous conclusion that the cultures are equally able to recognize socially awkward situations.

However there was a significant effect for culture on faux pas understanding. The analysis showed that the Sotho/Tswana participants performed significantly worse than the English participants on this variable. This indicates that either the Sotho/Tswana students did not have sufficient language skill to answer the rest of the questions according to the strict marking guide, or they recognised that something was awkward but could not conceptualise the full complexity of the situation.

The mixed factorial ANOVA indicated a significant main effect for story type. The participants performed better on the TOM stories than on the control stories. This is not unexpected normal adults should be able to recognize socially awkward situations easily. In part this result could also be attributed to a tendency among the participants to assume more of the stories were awkward than not. The way some of the stories are constructed makes the

interactions seem very stilted and abrupt. This made participants interpret the control stories as awkward, as they interpreted the situations as being rude. For example quite a few participants thought the first control story was a faux pas. In the story, ‘Vicky was at a party at her friend Oliver’s house. She was talking to Oliver when another woman came up to them. She was one of Oliver’s neighbours. The woman said, "Hello," then turned to Vicky and said, “I don't think we've met. I’m Maria, what's your name?" "I’m Vicky." "Would anyone like something to drink?" Oliver asked’ (Stone et al., 1998). The control questions suggest the participants knew what happened in the story but they interpreted the women’s actions as rude and inquisitive.

There was not a significant difference for the results of the one-way ANOVA using control questions as the dependent variable. This indicates that the groups all understood the stories equally. Additionally, given that the participant’s answered nearly all of the control questions correctly it indicates they all had a good understanding of the stories.

Participant and Researcher Comments on the Faux Pas task

This test involves a heavy reading quotient that in itself may be a hurdle to some participants who are not used to reading large amounts. Some of the Sotho/Tswana students took an additional hour to complete the tasks. This longer time has two possible explanations. First the Sotho/Tswana speakers are not used to English and so they needed to go slowly to translate the tasks. If so, the addition of pictures or video could aid the participants. Most clinical populations and community controls consist of people with far less English proficiency than these students. A second possibility is that the Sotho/Tswana participants do not automatically categorise the stories as awkward or not, they have to think semantically about the story and categorise according to their knowledge of Western culture.

For some of the stories the participants correctly answered the control questions but made small mistakes in the story. For example in one of the stories a woman, Claire, has a difficult conversation with a lawyer on the phone. She storms into the coffee room were Roger, a new colleague, and Andrew are talking. Unknown to her Roger has just said his wife is a lawyer. As Claire comes into the room she says all lawyers are arrogant and greedy. A few participants said it was Andrew’s wife who was the lawyer, yet when asked the control questions they answered correctly that Rodger’s wife was a lawyer. If the control questions were at the beginning of the questioning it may help the participants clarify the story and avoid mistakes such as this.

In other cases student genuinely did misunderstand the story. In another story Joan is walking with her dog, when she meets her friend. They agree to walk home together, but Joan's dog would not come when called, so she said to her friend 'I think we'll stay.' Her friend says, 'Ok, I'll see you later' (Stone et al, 1998). One participant misunderstood the sentence 'I think we'll stay' to mean the person is rudely ordering her friend to stay at the park, not that she is going to stay at the park waiting for her dog, and interpreted the story as a faux pas.

The stories were all printed in a paragraph form. One participant misattributed what someone said to another character, and interpreted a control story as awkward. In future if the stories were printed with a new line starting when a new person speaks this may help the participants understand who is saying what and thus understand the stories better.

One of the questions in the faux pas understanding set is 'why did s/he say something they shouldn't have said or something awkward.' A correct answer states that the person was unaware of or misunderstood the situation. However many of the participants gave a psychological reason for the person's actions, i.e. they were being honest, or angry. For example in the story mentioned earlier about lawyers - Claire has a difficult conversation over the phone with a lawyer. As she walks into the coffee room she says all lawyers are arrogant and greedy. Unbeknownst to her Rodger, a new colleague just mentioned his wife is a lawyer. A correct response to why she said it would be that she did not know that Rodger's wife was a lawyer. However the majority of the participants said she was upset by the phone call. I suggest keeping the question open-ended, as it allows for broader responses. Then if the participant does not mention that the character was unaware of the facts ask a more straightforward question, like 'did Claire know that Rodger's wife was a lawyer?'

It may be appropriate to make references in the stories more expressly South African. For instance one story involving a man filling up his car with petrol confused several participants. The man fills up his car himself, whereas in South Africa, petrol attendants do this. This caused some of the participants to be confused by the interaction. One participant even said, I don't understand why he said he filled up the car with unleaded petrol, the attendant would know that. Additionally some of the Sotho/Tswana participants struggled with the English names of the characters, so it may be helpful have some African names.

In part, no doubt, because of their English names, one of the participants said all the character's seemed white and middle class. Given that the majority of Southern Africans are not white or middle class; this should be changed to reflect the broader population.

Limitations and Future Research

Due to the fact that each participant took two hours to assess meant that the sample size for this study is too small for high statistical power. Additionally the culture groups were of unequal sizes which also reduced the credibility of the results. In future a larger study can easily solve these limitations.

The study relied on the fact that the participants would be students from university and thus have similar levels of education. This allowed us to not be concerned with education as a confounding variable. However in the wider South African population educational quality varies substantially. Someone who went to a former model c school tends to have a better quality of education. So it would be beneficial to ask future participants what High School they went to and what level of education they have attained. One study found that quality of education made a difference in participants' intelligence scores (Shuttleworth-Edwards et al., 2004) so education levels could make a difference to adult TOM performance.

One participant said in response to the qualitative questionnaire that he believed social class would make more of a difference than culture on the task results. Cutting and Dunn (1999) found that socio-economic status (SES) did affect false-belief comprehension in children. Future research should investigate whether SES affects adult TOM performance.

The groups were also unbalanced with regard to sex. Research indicates that there are sex differences on empathetic tasks (Rueckert & Naybar, 2008). Future research should control for this, to ensure that sex is not a covariate.

This study had to use language as a proxy for culture for ethical reasons. Future research should use a more comprehensive operational definition of culture. Additionally there is no test of acculturation for South Africans. Future research should attempt to measure how accultured participants are to Western culture.

This study was the first to investigate adult TOM across cultures, so university students were assessed in an attempt to narrow the possible extraneous variables. Future research, however should account for factors such as SES and acculturation and ideally the tasks should be translated into South African languages and participants assessed in their home language.

CONCLUSION

Previous studies investigating TOM across cultures have used false-belief tasks. Results have indicated that the ability to understand false-belief tasks is consistent across cultures. However false-belief tasks are only appropriate to use with children. There is no research on whether adult TOM is consistent across cultures. False-belief tasks only form one small aspect of TOM. TOM is wider than inferring false-belief especially adult TOM which is used to make sense of complex social situations. It may well be that the building blocks of simple TOM, measured by false-belief tasks, are consistent across cultures, but more complex adult TOM may vary across cultures.

Tasks have been developed overseas to measure adult TOM, but no research has been done on adult TOM performance across cultures. The aim of this study was to investigate whether it was appropriate to use TOM tasks, developed in a Western culture, in South Africa. South Africa provides a unique opportunity to investigate whether adult TOM performance is consistent across cultures.

Theory about the mechanism underlying TOM, proposes two alternatives to this question of consistent performance across cultures. Modular theory states that TOM is based on an innate neurological module as such TOM ability is consistent across cultures. In contrast 'theory' theory argues that TOM develops from social and cultural experiences, in which case TOM may differ widely across cultures.

This study examined adult TOM performance in students from different cultures on the three main tasks measuring adult TOM: Strange Stories, Reading the Mind in the Eyes and Faux Pas. The results suggest that TOM is consistent across culture supporting modular theory. However this sample was highly homogenized in terms of English language ability and exposure to Western culture, so a more disadvantaged population may reveal more variance between cultures, supporting 'theory' theory.

It is also well known that most psychological tests are biased racially and culturally. Thus the other aim of the study was to asses whether features of the tasks biased non-English participants. The results show that some features of the tasks (such as culturally specific knowledge and vocabulary) did bias participants from non-English cultures, which suggests these tasks need to be modified before being used to assess TOM in the broader South African population.

REFERENCES

Apperly, I., Samson., D., & Humphreys., G. (2009). Studies of adults can inform accounts of theory of mind development. *Developmental Psychology, 45*, 190-201.

Avis, J., & Harris, P. (1991). Belief-desire reasoning among Baka children: evidence for a universal conception of mind. *Child Development, 6*, 460-467.

Baron-Cohen, S., Leslie, A.M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21,* 37-46.

Baron-Cohen, S., Riviere, A., Fukushima, M., French, D., Hadwin, J., Cross, P., et al. (1996) Reading the mind in the face: a cross cultural and developmental study. *Visual Cognition*, *3*, 39-60.

Baron-Cohen, S., Jolliffe, T., Mortimore, C., & Robertson., M. (1997). Another advanced test of theory of mind: evidences from very high functioning adults with autism or asperger syndrome. *Journal of Child Psychology and Psychiatry, 38*, 813-822

Baron-Cohen, S., O'Riordan, M., Jones, R., Stone, V.E., & Plaisted, K. (1999). A new test of social sensitivity: Detection of faux pas in normal children and children with Asperger syndrome. *Journal of Autism and Developmental Disorders, 29*, 407-418.

Brickman, A., Cabo, R., & Manly, J. (2006). Ethical issues in cross-cultural neuropsychology. *Applied Neuropsychology, 13*, 91–100.

Brune, M., & Brune-Cohrs, U. (2006). Theory of mind – evolution, ontogeny, brain mechanisms and psychopathology. *Neuroscience and Biobehavioral Reviews, 30,* 437-455.

Callaghan, T., Rochat, P., Lillard, A., Claux, M. L., Odden, H., Itakura, S., et al. (2005). Synchrony in the onset of mental-state reasoning: evidence from five cultures. *Psychological Science*, *16*, 378-84.

Chasiotis, A., Kiessling, F., Hofer, J., & Campos, D. (2006). Theory of mind and inhibitory control in three cultures: Conflict inhibition predicts false belief understanding in Germany, Costa Rica and Cameroon. *International Journal of Behavioral Development*, *30*, 249-260.

Corcoran, R., & Frith, C.D., (2005). Thematic reasoning and theory of mind. Accounting for social inference difficulties in schizophrenia. *Evolutionary Psychology, 3*, 1–19.

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan Executive Function System Manual*. Oxford: UK: Pearson Assessment

Gallese, V., & Goldman. (1998). Mirror neurons and the simulation theory of mind reading. *Trends in Cognitive Sciences, 2*, 493-501.

Gopnik, A. (1996). Theories and modules: Creation myths, developmental realities, and Neurath's boat. In P. Carruthers & P. K. Smith (Eds.), *Theories of theories of mind* (pp. 169-183). Cambridge,England: Cambridge University Press.

Happe, F. (1994). An advanced test of theory of mind: Understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal of Autism and Developmental Disorders, 24,*129-154.

Happe, F., Brownell, H., & Winner, E., (1999). Acquired 'theory of mind' impairments following stroke. *Cognition 70*, 211–240.

Helms, J. (1992). Why is there no study of cultural equivalence in standardized cognitive ability testing? American Psychologist, 47, 1093-1101.

Hughes, C., & Leekam, S,. (2004). What are the links between theory of mind and social relations? Review, reflections and new directions for studies of typical and atypical development. *Social Development, 13*, 590-619.

Lillard, A. (1998). Ethnopsychologies: cultural variations in theories of mind. *Psychological Bulletin, 123*, 3-32.

Lillard, A. (1999). Developing a cultural theory of mind: the CIAO approach. *Current Directions in Psychological Science, 8*, 57-61.

Liu, D., Wellman, H., Tardif, T., & Sabbagh, M. (2008). Theory of mind development in Chinese children: a meta-analysis of false-belief understanding across cultures and languages. *Developmental Psychology, 44,* 523- 531.

Manly, J. (2008). Critical issues in cultural neuropsychology: profit from diversity. *Neuropsychology Review*, 18, 179-183.

Naito, M., & Koyama, K. (2006). The development of false-belief understanding in Japanese children: Delay and difference? *International Journal of Behavioral Development, 30*, 290-304.

Peterson, C. C., & Siegal, M. (1998). Changing focus on the representational mind: Deaf, autistic and normal children's concepts of false photos, false drawings and false beliefs. *British Journal of Developmental Psychology, 16*, 301–320.

Perner, J., Ruffman, T., & Leekam, S. (1994). Theory of mind is contagious: you catch it from your sibs. *Child Development, 65*, 1228-1238.

Richardson, K. (2002). What IQ tests test. *Theory & Psychology, 12*, 283-314.

Rueckert, L., & Naybar N. (2008) Gender differences in emphathy: the role of the right hemispher. *Brain and Cognition, 67*, 162-167

Suzuki, L., Ponterotto, P., & Meller, P. (2001). *Handbook of Multicultural Assessment*. (2nd ed.). San Fancisco, USA: Jossey-Bass.

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

Scholl, B., & Leslie, A. (1999). Modularity, development and 'theory of mind.' *Mind and Language*, *14*, 131-153.

Shuttleworth-Edwards, A., Kemp, R., Rust, A., Muirhead, J., Hartman, N., & Radloff, S. (2004). Cross-cultural effects on IQ test performance: a review and preliminary normative indication on WAIS-III. *Journal of Clinical and Experimental Neuropsychology*, 26, 903-920.

Stone, V.E., Baron-Cohen, S., & Knight, R.T. (1998). Frontal lobe contributions to theory of mind. *Journal of Cognitive Neuroscience*, *10*, 640-656.

Watson, A., Painter, K., & Bornstein, M. (2001). Longitudinal relations between 2-year-olds' language and 4-year-olds' theory of mind. *Journal of Cognition and Development, 2*, 499-457.

Wellman, H., Cross, D., & Watson, J. (2001). Meta-analysis of theory of mind development: The truth about false belief. *Child Development*, *72*, 655–684.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence Manual*. San Antonio, Texas: The Psychological Corporation.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: Epidemiology and classification. *Journal of Autism and Developmental Disorders*, *9*, 11-29.

Youngblade, L., & Dunn, J. (1995) Individual differences in young children's pretend play with mother and sibling: links to relationships and understanding of other people's feelings and beliefs. *Child Development, 66*, 1472-1492.

APPENDIX A

Informed Consent Form

INFORMATION AND INFORMED CONSENT FORM:

INVESTIGATION OF THEORY OF MIND IN SOUTH AFRICAN POPULATIONS

PURPOSE:

This study is part of a research project investigating Theory of Mind in South Africa. Theory of Mind is regarded as a universal human ability to think about other people's mental states, eg how they feel, what they know, intend, desire, etc. Theory of Mind development has been studied in various cultures, but this is the first study being conducted in South Africa. Many of the standard tasks developed to measure Theory of Mind abilities were developed in the UK, so it is important to establish if South Africans think in similar ways, or if the tasks need to be modified for our context.

STUDY PROCEDURE:

If you decide to participate, we will ask you to attend a session in the ACSENT lab in the Psychology Dept. The tasks will take 120 minutes to complete, so you will get 4 SRPP credits for participating in this study. You may be asked to return for a short focus group interview session with other students to discuss the tests and your perception of them (for extra SRPP points).

We will ask you to provide some demographic information about yourself (gender; home language).

The Theory of Mind tasks will involve pen and paper or verbal responses. The tasks involve choosing which of 4 emotions best describes a displayed facial expression; deciding if a described social interaction is awkward; and deciding why people say or do things in short story segments. In addition, a few other short items will be administered – these will give a rough estimate of IQ and executive function.

CONFIDENTIALITY:

If you consent to participate in this study, your identity will be kept confidential. All research information will be safely stored and identified by code number and access will be limited to authorized scientific investigators. Any publications resulting from this study will not identify you by name.

VOLUNTARY PARTICIPATION:

Your participation in this study is voluntary and you may refuse to participate or withdraw from the study at any time.

RESEARCH QUESTIONS AND CONTACTS:

The researchers will answer any questions you might have about the procedures described above, or about the results of the study. If you have any questions, you may call Susan Malcolm-Smith on 021 650 4605. Or preferably e-mail Alice Lazarus or Margaret Mc Grath at theorymind.uct@gmail.com

INFORMED CONSENT:

I have read the above information, my questions have been answered, and I consent voluntarily to participate in this study.

Participant name: _____ Signature:_____

Date: _____

I have discussed the proposed research with this participant and, in my opinion, s/he understands the benefits, risks, and alternatives (including non-participation) and is capable of consenting to voluntary participation.

Print name: _____ (study reseacher)

Signature: _____

Date: _____

APPENDIX B

Qualitative Questionnaire

1) Did you find any of the Instructions and/or Questions confusing?

2) Where there any words that were new to you?

3) How difficult or easy were these tests, which was the most difficult?

4) Were the stories easy to understand?, why/ why not

5) Were there any situations in the stories that were new to you

6) Do you think this test was culturally relevant to your culture group?

7) Did the stories represent culturally appropriate social situations?

8) Were any of the interactions culturally inappropriate?

9) How could this test be changed to be made more appropriate for your culture group?

Plagiarism Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the SAJP convention for citation and referencing. Each contribution to, and quotation in, this essay/report/project/ from the work(s) of other people has been attributed, and has been cited and referenced.
3. This essay /report/project/ is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.
5. I acknowledge that copying someone else's assignment or essay, or part of it, is wrong, and declare that this is my own work.

Margaret Mc Grath

Signature: .....

Date: 29 October 2009