

**Illusory Correlation: Interplay of Evaluative Group
Impression and Item-specific Episodic Memory**

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Statement of Shared Data

Findings from the current study were obtained in collaboration with the study by Alex Roach, whose study was also conducted in partial fulfillment of the requirements for the Honours program in Psychology in the Research School of Psychology at the Australian National University. Whilst the current study was interested in the different mechanisms that lead up to Illusory Correlation (IC), the study conducted by my colleague investigated the IC trend by manipulating the number of statements presented to participants. As such, participants were presented with three different blocks of statements: Block 1 (9 statements), followed by Block 2 (36 statements) and finally, Block 3 (54 statements). After each block, participants engaged in a Trait Rating task and a Group Assignment task. The current study however, is specific to the findings of these tasks in Block 2 only. Thus, the Group Assignment task in Block 2 varied from that in Block 1 and 3, such that, it included decoy statements, which were required for the analysis of item-specific episodic memory in the current study and not in the study conducted by my colleague. The Trait Rating task was the same across all three blocks. In short, only data collected from the second part of this three-part experiment (excluding responses on decoy statements) were shared.

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Abstract

Illusory Correlation (IC) is the perception that two events are associated with each other, when in reality they are not. The current study tested predictions of the Multiple Component Model (MCM) regarding the role different types of information (i.e., evaluative and item-specific information) play in producing the IC effect. The current study extended previous experiments on IC, particularly that by Van Rooy, Vanhoomissen and Van Overwalle (2013), in using two independent trait dimensions (i.e., Common Trait and Rare Trait), rather than the traditionally used one evaluative dimension (i.e., frequent, desirable vs. infrequent, undesirable behaviours). The MCM predicted that, judgements based on evaluative information, would result in an association between the majority group and the common trait (Majority-Common Trait), whereas the minority group would be associated with the rare trait (Minority-Rare Trait). For judgements based on item-specific episodic memory, the MCM predicted enhanced memory amongst participants for Minority-Rare Trait statements. Partial support was found for both predictions: Participants did develop a Majority-Common Trait association, but no particular association was formed with the minority group. Additionally, participants did show enhanced memory for Minority-Rare Trait statements. However, they also showed unexpected enhanced memory for Majority-Rare Trait statements. Together, the current results further elucidate the interplay of evaluative and item-specific information when reporting judgments on a majority and minority group respectively. The finding of a Majority-Rare Trait association however, implies the need for further studies to examine the exact nature (i.e., evaluative or episodic) of this association and its implications in causing IC.

Introduction

“Why do they hate us?” He paused. “We didn't do anything wrong.”

-Shannon Thompson, *November Snow*

The social environment, in which we live in, is one that is complex with various events occurring at once; and as social beings, we find ourselves in a meaning seeking pursuit of these events. In doing so however, we sometimes perceive two events to be associated with each other when in reality, they are not. This inaccurate perception, which stems from the field of Social-Cognitive Psychology is termed, Illusory Correlation (IC, Chapman, 1967). For instance, the fear of approaching someone due to the perception that members of his community are involved in violent criminal acts, is an example of IC. Deriving from this same logic, IC has been suggested to contribute towards stereotyping (Hamilton & Gifford, 1976), minority discrimination (Hamilton & Gifford, 1976) and including, inaccurate clinical diagnoses (Chapman & Chapman, 1967; Dawes, 1989).

In a typical study on IC, participants learn behavioural statements about two groups, a Majority Group A and a Minority Group B, whereby the majority group is twice the size of the minority group; one behaviour (i.e., desirable behaviour) is more frequent than the other (i.e., undesirable behaviour) and the ratios of the two behaviours are identical both between and within the two groups (Hamilton & Gifford, 1976; see Table 1). As such, there is no actual relationship between group membership and desirability of behaviours. Nonetheless, typical results from studies on IC demonstrate participants to have formed a greater positive perception of Majority Group A and over attributed the frequency at which members of Minority Group B engaged in undesirable behaviours.

Table 1

Distribution of Stimulus Statements in Hamilton & Gifford (1976)

Behaviours	Majority Group	Minority Group	Total
Desirable	18	9	27
Undesirable	8	4	12
Total	26	13	19

Over the years, the research area on IC has extended such that various theories and models have been proposed with the aim of explaining the mechanisms that underlie and thus, cause the IC effect. Yet, there is still a lack of definitive conceptual understanding of this phenomenon. Hence, these theories and models are first explored in respect to the development of the current study.

Distinctiveness Based Model

The dominant theory used in explaining the IC effect is the Distinctiveness Based Model (DBM), proposed by Hamilton and Gifford (1976). This model assumes that the co-occurrence of two distinctive items leads to the perception that they are associated, whereby distinctiveness refers to infrequent occurring items. Specifically, this model suggests that when two distinctive items co-occur (i.e., minority groups and infrequent undesirable behaviours), they are salient to perceivers, which leads to better encoding of these items in memory, and therefore the idea that they are correlated (Hamilton & Gifford, 1976).

Various studies have been able to provide empirical support for this model. In particular, studies have found participants to over attribute infrequent, undesirable behaviours to the minority group (Johnson & Mullen, 1994), spend more time reading statements of undesirable behaviours engaged by members of the minority group (Stroessner, Hamilton & Mackie, 1992), recall more infrequent, undesirable behaviours

of the minority group (Hamilton, Dugan & Troler, 1985) and were faster in assigning undesirable behaviours to the minority group (Johnson & Mullen, 1994; McConnell, Sherman & Hamilton, 1994a). Further support for the DBM were found by studies, which revealed a significant correlation between the extent of IC and the assignment latencies for the infrequent, undesirable behaviours of the minority group (Johnson & Mullen, 1994) and also with the recall of infrequent, undesirable behaviours of the minority group (Hamilton et al., 1985).

Despite the numerous empirical support for the DBM, Fiedler (1991) raised the argument that the DBM's assumption on what is 'distinctive' might be confounded with infrequency, which could have impacted the results obtained. This was demonstrated in a study by Risen, Gilovich and Dunning (2007), whereby a single, unusual behaviour by a member of a minority group was found to be more memorable than other types of behaviours; thus, causing an IC. Nevertheless, the DBM has led to the emphasis of frequent and/or infrequent events in the formation of IC.

Availability and Memory

For instance, Rothbart (1981) suggested that because there is more information about the desirability of the majority group, this information is more accessible in memory, thus, leading perceivers to associate the majority group with the frequently occurring desirable behaviours. The basis for this account of IC stems from the availability heuristic, which is defined as the ease at which information comes to mind (Tversky & Kahneman, 1973). Empirical support for Rothbart's (1981) notion of availability was found in the study by Hamilton and Sherman (1989), whereby the IC effect was implied with the overestimation of the frequent, desirable behaviours by the majority group. As such, in contradiction to the DBM, rather than the infrequent, undesirable behaviours of the minority group, it was instead proposed that the desirability of the majority group is what that drives the IC effect.

Extending from this idea, Manis, Shedler, Jonides and Nelson (1993) found that, availability has consequences in judgments that are dependent on the recall of the overall evaluation of a category but not on judgments that are dependent on the recall of the items that makes up the category. This suggests the availability account to have implications on IC from an evaluative perspective, neglecting item-specific memory.

Exemplar Based Memory

On the contrary, Smith (1991) showed that the IC effect can be accounted for by a purely memory based model (see Hintzman, 1984; 1986), which excludes assumptions of biased attention on encoding. According to Smith (1991), memory responses are proportional to the algebraic sum of memory traces that correspond to the valence of each behaviour for each group, and not the proportion of desirable and undesirable behaviours across the groups. Thus, Smith (1991) suggested that participants would show greater liking for Majority Group A due to its larger difference in desirable and undesirable behaviours (i.e., 18 desirable – 8 undesirable = 10) than in Minority Group B (i.e., 9 desirable – 4 undesirable = 5).

As assumed, results from the study by Smith (1991) found behaviours associated with the majority group to be rated more positively in comparison to behaviours associated with the minority group. Further support for this model comes from the study by Shavitt, Sanbonmatsu, Smittipatana and Posovac (1999), which showed greater favourability for Majority Group A when the difference in desirable and undesirable behaviours between the majority and minority group became increasingly larger.

Nonetheless, Smith (1991) also suggested the possibility of multiple mechanisms to drive the IC effect, as results supporting the DBM were also found (i.e., preferential encoding of the infrequent, undesirable behaviours of the minority group).

Information Loss Account

Similar to the model proposed by Smith (1991), Fiedler (1991; 1996) introduced an Information Loss Account (ILA) of the IC effect. According to the ILA, group judgments are based on the aggregation of memory traces that correspond to the valence of the behaviour, and that this aggregation is sensitive to the size of the group. Specifically, due to the larger amount of information related to the majority group, the extended aggregation of frequent, desirable and infrequent, undesirable behaviours serves to cancel out error variance (i.e., information loss) and as such, perceptions of desirable-to-undesirable ratio are less biased and more accurate for the majority group. However, with the minority group of which, there is less information about, there is greater error variance and thus, greater difficulty in detecting the dominance of the frequent, desirable behaviour (Fiedler, 1991; 1996; Fiedler, Russer & Gramm, 1993). In other words, the ILA assumes the IC effect to be due to the better extraction of information related to the majority group, and poorer processing of infrequent, undesirable minority behaviour (Fiedler, 1991; 1996; Fiedler et al., 1993; Fiedler, Kemmelmeier & Freytag, 1999).

Assumptions of the ILA are empirically supported with findings from studies (Fiedler, 1991; Fiedler et al., 1993), which showed information processing amongst participants to be superior for frequent items (i.e., desirable, majority behaviours) but impaired for infrequent items (i.e., undesirable, minority behaviours). Added support for the ILA comes from the study by Shavitt et al. (1999), whereby the majority group was judged more favourably even when both the majority and minority groups were represented only by desirable behaviours (i.e., absence of distinctive behaviour); which further corroborates the assumption of superior information processing for the majority group than the minority group.

Differentiation Approach

According to the Differentiation Approach (DA) as proposed by McGarty, Haslam, Turner and Oakes (1993) the IC effect is in fact, not illusory, but one that occurs due to real differences between the majority and minority groups. Particularly, the DA assumes that the greater number of positive behaviours versus negative behaviours belonging to the majority group (i.e., 18 desirable – 8 undesirable = 10) than to the minority group (i.e., 9 desirable – 4 undesirable = 5) is of a real difference, which perceivers then attenuate, thus producing the IC effect. It is further assumed that the attenuation of evaluative differences between groups is the result of a perceiver's need to distinguish one group from another (Berndsen, McGarty, van der Pligt & Spears, 2001; Haslam, McGarty & Brown, 1996; McGarty et al., 1993).

Empirical support for this approach comes from a non-typical study of IC (McGarty et al., 1993), whereby participants were not shown stimulus information about groups and desirability of behaviours. Instead, participants were merely told that there were twice as many statements about Majority Group A than Minority Group B, and that half of the statements implied desirable behaviours performed by Majority Group A. Results of their study found that, the mere information on the distribution of behaviour between the groups was able to produce IC effects, whereby results obtained predominantly found undesirable behaviours to be overrepresented in the minority group.

McGarty et al. (1993) suggested the findings to imply categorization effects (Tajfel, 1969; Tajfel & Wilkes, 1963) as an adaptive meaning seeking process, which thus led to the proposal of the DA. Other studies (Corneille & Judd, 1999; Krueger & Rothbart, 1990; Krueger, Rothbart & Sriram, 1989) that provide support for the DA have also used the concept of categorization to demonstrate how perceivers' discriminatory perception between groups can lead to an IC effect.

Attention Theory

Stemming from the idea of differentiation, The Attention Theory (AT; Sherman et al., 2009) was based on the Attention Theory Model of Category Learning (Kruskhe, 1996; 2001; 2003). In their study (Sherman et al., 2009), a modified paradigm of the IC was introduced. Here, instead of measuring IC on one evaluative dimension (i.e., desirability of behaviour), IC was measured on two evaluative dimensions (i.e., friendliness and intelligence). More specifically, instead of describing members of a majority group and a minority group with commonly occurring *desirable* behaviours and rarely occurring *undesirable* behaviours, members of both groups were described with a commonly occurring trait (e.g., intelligence) and a rarely occurring trait (e.g., friendliness).

It was reasoned that studies, which test IC on a single evaluative dimension fall short in illustrating the full mechanics of IC. This is because, when judgments are made on a single evaluative dimension, it is uncertain as to whether perceivers were assuming the majority group to be more positive than the minority group, the minority group to be more negative than the majority group or if both these assumptions were being made (Sherman et al., 2009).

As such, the AT (Sherman et al., 2009) instead suggests perceivers to first form an association between the majority group and the common trait as both the majority group and the common trait occur more frequently. Then, to distinguish the minority group from the majority group, attention is shifted to the rare trait in the minority group, which then forms an association between the minority group and the rarely occurring trait.

Therefore, the AT is similar to the category accentuation effect demonstrated in previous studies (Corneille & Judd, 1999; Krueger & Rothbart, 1990; Krueger et al., 1989), such that perceivers attend more carefully to distinctive features of a minority group that differentiate them from a majority group. At the same time, the AT uses

components of the DBM and the DA, whereby like the DA, the AT assumes perceivers to differentiate the minority group from the majority group. But unlike the DA, the AT assumes that differentiation occurs by the subsequent learning of the minority group after the majority group, and not through exaggerated real group differences (Sherman et al., 2009). On the other hand, like the DBM, the AT can account for the greater attention given to the infrequent behaviours performed by the minority group. However, unlike the DBM, the basis for this special attention is assumed to be contextual distinctiveness rather than numerical distinctiveness.

Findings from the study by Sherman et al. (2009) supported the AT such that participants associated the majority group with the commonly occurring trait (Majority-Common Trait) and the minority group with the rarely occurring trait (Minority-Rare Trait). Their results, however also showed the Minority-Rare Trait association to have a greater effect compared to the marginally reliable Majority-Common Trait association. Differences between these associations were justified to be due to the special attention paid to the rare traits in the minority group (Sherman et al., 2009). This suggestion of differential strengths between the Majority-Common Trait and Minority-Rare Trait associations can be related with the findings of Sherman, Hamilton and Roskos-Ewolden (1989), whereby, it was found that when a third group, C was introduced into the context, only judgments on Minority Group B were affected, without any effects on the judgments of Majority Group A. Nevertheless, the marginally significant Majority-Common Trait association, as found in Sherman et al. (2009) bears with it a need to further investigate the differences between the Majority-Common Trait and Minority-Rare Trait associations and how they may play different roles in producing the IC effect.

Sherman et al. (2009) also argued that most previous theories on IC would be unable to explain the findings of IC on two evaluative dimensions. That is, whilst the DBM would only be able to justify findings of the Minority-Rare Trait association, it

would not be able to justify the Majority-Common Trait association, and vice versa with the suggestions put forward by Rothbart (1981). On the other hand, the DA, which looks at the actual difference in number of frequent and infrequent behaviours between the majority and minority groups, would be able to account for IC when they are presented on a single evaluative dimension, but not when they are presented on two separate dimensions as it would not be logical for a perceiver to find the difference in number of friendly and intelligent members in a majority and minority group (Sherman et al., 2009). Nevertheless, a model proposed by Van Rooy, Van Overwalle, Vanhoomissen, Labiouse and French (2003) might be able to predict comparable results when IC is presented on two evaluative dimensions.

Multiple Component Model

The Multiple Component Model (MCM; Van Rooy et al., 2003) states that, in a typical IC experiment, perceivers will create a mental representation linking (i.e., associating) a social group with an overall evaluative impression, and with item-specific behavioural information. More specifically, as perceivers process behavioural statements about the two groups, they incrementally develop prototypes of both the majority and minority group. Each prototype contains evaluative (i.e., desirable or undesirable) information and item-specific information (i.e., an episodic trace). This is illustrated in Figure 1. Therefore, the simultaneous encoding of evaluative information and item-specific information leads to the development of evaluative and episodic links respectively ¹.

¹ Episodic links refer to the encoding of an association as an episodic memory, which is a class of memory that is specific to events that have been personally experienced (Tulving & Thomson, 1973).

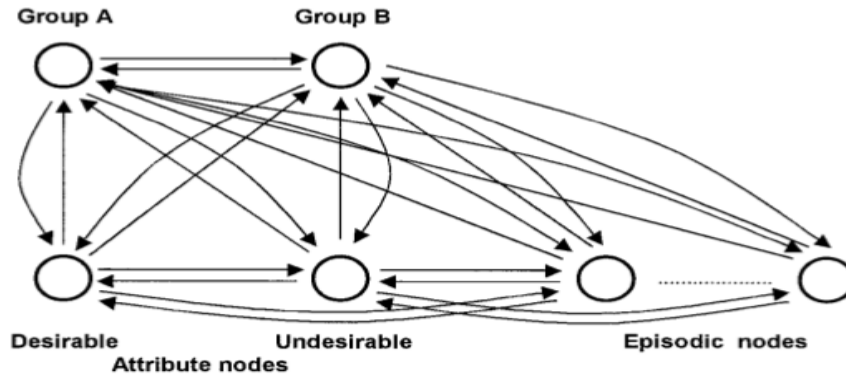


Figure 1. *Multiple Component Model*

Links are simultaneously formed, whereby evaluative links extend from the groups to the attribute nodes, whereas episodic links extend from the groups to the episodic nodes.

Reprinted from “A Recurrent Connectionist Model of Group Biases,” by D. Van Rooy, F. Van Overwalle, T. Vanhoomissen, C. Labiouse and R. French, 2003, *Psychological Bulletin*, 110(3), p. 539. Copyright 2003 by the American Psychological Association, Inc. Reprinted with permission.

Learning is assumed to be driven by a connectionist learning algorithm (i.e., the delta algorithm by McClelland and Rumelhart, 1988), which exhibits two key emergent properties: The acquisition and competition properties. The acquisition property refers to the fact that, with every statement presented, the prototype becomes more established and more clearly encoded in memory. For instance, each time information describes a member of Majority Group A performing a desirable behaviour (“John, member of group A, helps an old lady across the street”), the association between Majority Group A and a desirable evaluation will become stronger.

At the same time, that specific behaviour (“John, member of group A, helps an old lady across the street”) is encoded in an episodic trace that is associated to Majority

Group A as well. Thus, each piece of behavioural information is encoded by two links: Its evaluative meaning ("the behaviour is good") and its unique item-specific episodic meaning ("helps an old lady across the street"). Because of this semi-distributed representation, the MCM makes different predictions for judgments based on evaluative versus item-specific information. On judgments that do *not* rely on the retrieval of item-specific information (i.e., evaluative ratings of the groups, assignment of behaviours to groups), the MCM predicts an evaluative bias in favour of the majority group, due to the *acquisition* property, such that there is simply more information linking the majority group with positive behaviour in a typical IC design.

Increasing evaluative links however, impair memory for discrete episodic traces of information. This prediction is based on the second emergent property. That is, because of *competition* between the weights of the links, the stronger evaluative links tend to block the development of weaker episodic links (see Van Rooy et al., 2003, p. 540, section on "Competition property and discounting"). This principle is similar to discounting in causal explanation (Kelley, 1971) and associative learning (Rescorla & Wagner, 1972), where stronger explanations tend to overshadow weaker ones. Thus, because of its greater group size, the competition property will more strongly affect the episodic links of the majority group. In other words, the MCM predicts that, because the episodic links for the minority group are less "blocked" by its evaluative links, there will be better retrieval of minority behaviours. Similarly, because there are typically more desirable behaviours than undesirable in an IC experiment, stronger memory impairment occurs for desirable behaviours, leading to better retrieval of undesirable behaviours (i.e., undesirable, minority group behaviours). These memory effects are predicted to be revealed in accuracy measures of episodic traces, such as accuracy of group assignment and free recall (Van Rooy et al., 2003; Van Rooy, Vanhoomissen & Van Overwalle, 2013).

Support for the MCM has been demonstrated in a study by Van Rooy et al. (2013), which found evidence for a dual, evaluative and episodic links of IC. Specifically, it was found through evaluative links, that as group size decreased, IC increased as indicated through increasingly negative judgments of smaller groups. However, item-specific episodic memory was enhanced as group size decreased, with better memory for infrequent, undesirable behaviours over the frequent, desirable behaviours. As such, this study provided novel support for a number of previous studies (Hamilton et al., 1985; Johnson & Mullen, 1994; McConnell et al., 1994a), which showed infrequent, undesirable behaviours of the minority group to be enhanced in memory.

In addition, Van Rooy et al. (2013) demonstrated that, although item-specific episodic memory can contribute to a number of empirical findings associated to IC (i.e. better retrieval of undesirable minority behaviours), it is not necessary for IC to occur. Thus, their study provides clear support for previous studies, which have already suggested, but failed to clearly demonstrate, that enhanced memory for specific items is not a necessary precondition for an IC to occur (McConnell, Sherman & Hamilton, 1994b; McGarty et al., 1993).

The authors additionally argue that this can explain the contradictory findings in the IC literature. Specifically, it is argued that studies that did find evidence of enhanced memory for infrequent items (Hamilton & Gifford, 1976; Johnson & Mullen, 1994; Smith, 1989; Stronessner et al., 1992) may have used measures that tapped into the episodic links of information, whereas those that failed to find such findings (Fiedler 1991; 1996; Klauer & Meiser, 2000; Sanbonmatsu, Shavitt, Sherman & Roskos-Ewoldsen, 1987) may have measured IC at its evaluative links.

Current Study

The MCM has been illustrated (Van Rooy et al., 2003; Van Rooy et al., 2013) to account for a wide range of results associated with IC. The model however, has only

been specifically tested on IC designs using a single evaluative dimension (i.e., desirable vs. undesirable behaviours). Therefore, the current study aims to test the predictions of the MCM for a design in which two evaluative dimensions (i.e., friendliness and intelligence) are used rather than one as in previous studies. The researchers of the current study chose to focus on the MCM, not because it is superior to other accounts, but rather because it generates specific predictions about how evaluative and item-specific information will interact to produce IC effects in a design where two independent traits are used.

It is expected that the MCM would be able to account for IC when measured on two evaluative dimensions as evaluative links are assumed to be connected to two separate attribute nodes (i.e., one for desirable behaviours and another for undesirable behaviours) rather than one bipolar node (see Figure 1). This can thus, be directly applied to an IC paradigm similar to that used in the study by Sherman et al. (2009), as each attribute node would be able to represent each independent trait. Table 2 represents the design of the current study.

Table 2

Design of the Current Study

Group	Common Trait	Rare Trait	Total
Majority Group	16	8	24
Minority Group	8	4	12
Total	24	12	36

As is apparent from Table 2, the distribution of behaviours follows the typical IC design, such that in each group there are twice as many behaviours linking the group to the common as opposed to the rare trait. This also means that there is no objective relationship between the groups and either trait, as both groups show proportionally the

same distribution of evidence (i.e., 2:1 common to rare traits). This design will allow the current study to test a number of novel predictions by the MCM regarding the competition between the evaluative and episodic links that arise from using two independent, rather than one evaluative trait dimension. More specifically, the MCM predicts that competition or blocking will not only occur between different types of links (i.e. evaluative vs. episodic), but also within *similar* links. Particularly, between the Common Trait and Rare Trait evaluative links. Based on this assumption, the MCM predicts that:

H1. Majority Group A will be more strongly associated with the Common Trait in comparison to Minority Group B as measured through evaluative measures.

H2. Minority Group B will be more strongly associated with the Rare Trait in comparison to Majority Group A as measured through evaluative measures.

These predictions result from the interaction between the acquisition and competition properties. Because most of the information presented shows Majority Group A to be associated with the Common Trait, perceivers will associate the Common Trait more strongly associated with Majority Group A, compared to Minority Group B. Also, due to its competition property, the MCM predicts that the Majority-Common Trait evaluative link will *block* the development of the Majority-Rare Trait evaluative link. This same competition property is at work for Minority Group B, whereby the Minority-Common Trait evaluative link will *block* the development of the Minority-Rare Trait evaluative link.

However, this blocking effect will be stronger for Majority Group A compared to Minority Group B, simply because the Majority-Common Trait evaluative link is stronger than the Minority-Common Trait evaluative link (as a result of the acquisition property). Figure 3 graphically illustrates this. As a result of this competition dynamic,

Minority Group B will thus be more strongly associated with the Rare Trait in comparison to Majority Group A as measured through evaluative measures.

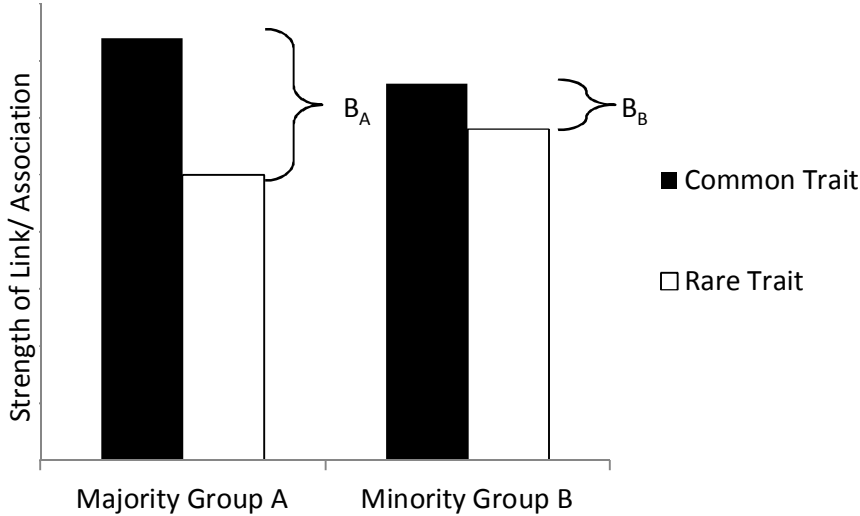


Figure 2. *Strength of Group-Trait evaluative links.*

B_A and B_B = Blocking effect within Majority Group A and Minority Group B, respectively. The blocking of the Rare Trait by the Common Trait is greater in Majority Group A than in Minority Group B. Thus, the Rare Trait is more strongly linked to Minority Group B than Majority Group A.

As explained earlier, the strength of episodic links is inversely related to that of evaluative links. In other words, the stronger an evaluative link, the weaker is its corresponding episodic link. For instance, the stronger *evaluative* links for Majority Group A will block the development of *episodic* links for behaviours performed by members of Majority Group A. This thus leads to greater episodic links for behaviours performed by Minority Group B. However, because the evaluative link of the Minority-*Common* Trait is stronger than that of the Minority-*Rare* Trait, less blocking occurs for

the episodic link encoding Rare Trait behaviours of Minority Group B. Therefore, this generates the third and final hypothesis:

H3. In comparison to Majority Group A, Minority Group B behaviours would be more enhanced in memory, with memory advantage for Rare Trait behaviours over Common Trait behaviours.

To properly test the MCM predictions regarding item-specific episodic memory, a novel multilevel approach to signal detection analysis is applied, which has been shown to be more reliable than other methods of analysis (see Van Rooy et al., 2013). This analysis will enable us to reliably test the MCM prediction regarding enhanced behavioural memory in judgments driven by item-specific information, and this quite independently from the bias apparent in judgments based on evaluative information.

Besides that, the current study intends to investigate the findings of Sherman et al. (2009) from the perspective of the MCM. Specifically, whilst the AT assumes perceivers to engage in an attention shifting mechanism, it does not offer an explanation in terms of the cognitive processes that may underlie it. Instead, through the current study, it is expected that the acquisition and competition property of the MCM would be able to do so. Furthermore, as the assumptions of the AT are restricted to the allocation of attention, it can make no predictions on memory. Thus, the use of the MCM in the current study would also enable aspects of the IC effect, which went undetected by the AT (Sherman et al., 2009), to be identified in the current study.

Conclusively, the current study aims to progress the research area on IC by bringing together past contradictory studies in finding a more conclusive explanation of the IC effect, which could then have practical implications in creating awareness on the mechanisms underlying IC.

Method

Participants

The study was conducted with 98 participants (17 males, 81 females), aged 16-54 ($M = 22.82$, $SD = 6.76$), who were recruited from the Australian National University and the general public. Participants were either financially reimbursed or rewarded with Psychology Research Credit, which was in partial fulfilment of their Psychology course. This sample size was determined based on a priori power analysis (Faul, Erdfelder, Lang & Buchner, 2007), with expected power to be comparable to that found in Sherman et al. (2009) and Van Rooy et al. (2013).

Design

This study had a 2 (Group) X 2 (Trait) Within-Subjects design. The two levels of the independent variable (IV), Group were Majority Group A and Minority Group B; whereas the two levels of the IV, Trait were Common Trait and Rare Trait. As such, each participant viewed Common and Rare Trait statements belonging to both Majority Group A and Minority Group B.

Materials

In total, each participant viewed 36 statements as past studies have established that empirical phenomena associated with IC peaks between 36-48 statements (Mullen & Johnson, 1990; Murphy, Schmeer, Vallée-Tourangeau, Mondragón & Hilton 2011)². The 36 statements were made up of 18 statements that were presented twice to ensure that episodic traces of the statements were clearly encoded in memory. Previous studies have shown that by presenting the statements twice, it assures strong memory performance that allows reliable analysis (Van Rooy et al., 2013). Table 3 shows the

²As part of a different experiment, participants were presented with statements prior to these 36 statements (identified as Block 1 in the experiment), and after these 36 statements (identified as Block 3 in the experiment). Separate data were collected for those blocks, which were not relevant to the purpose of the current study.

distribution of Common and Rare Trait statements between Majority Group A and Minority Group B that were presented to each participant. As illustrated, the ratios of Common and Rare Trait statements, both between and within groups were 2:1. Thus, there was no actual relationship between Trait and Group.

Table 3

Distribution of Statements in the Current Study

Group	Common Trait	Rare Trait	Total
Majority Group	8	4	12
Minority Group	4	2	6
Total	12	6	18

The statements used (see Appendix A) were adapted (with permission) from Studies 2 and 5 from Sherman et al. (2009). A number of statements were modified to make them more meaningful to an Australian sample (i.e. “*scored highly on the GAMSATS*” was changed to “*scored highly on the Year 12 HSC exams*”). A number of additional statements were also created and tested in a preliminary study, where participants were asked to rate the ‘friendliness’ and ‘intelligence’ of a list of statements on a 10-point scale. Past studies have shown that typical IC effects are more likely to occur when participants are presented with statements of moderate valence (Hamilton & Sherman, 1989). Thus, statements rated as moderately (i.e., $5.0 < M < 7.0$) ‘friendly’ and ‘intelligent’ were used in the current study.

Also, to prevent gender bias, all names were replaced with initials. Therefore, each statement consisted of an initial, a group (i.e., A or B) and a statement implying ‘friendliness’ or intelligence’. For instance, an intelligent statement would be, “MN, a member of Group A, grasps new concepts easily.”

In addition, the assignment of these ‘friendly’ and ‘intelligent’ statements as Common and Rare Traits were counterbalanced across subjects. Finally, the presentation of the statements was controlled by a custom-made computer code in Inquisit (Millisecond, 2012).

Procedure

Participants first read an Information Sheet (see Appendix C) and were seated individually in front of a desktop computer. They read instructions (see Appendix D) informing them that they were participating in a study on group perception, which were similar instructions used in previous IC experiments (see Van Rooy et al., 2013). Each statement remained on the computer screen until the participant pushed the space bar, or for a maximum of five seconds³. After viewing all 36 statements, participants completed two tasks. A previous study (Van Rooy et al., 2013) and our own pilot showed no order effects in regards to how the tasks were presented, and as such, they were not counterbalanced. At the end of the procedure, participants provided consent for the use of their data (see Appendix E) and were debriefed (see Appendix F).

Trait rating task. Participants were instructed to rate on four, 10-point scales, the extent to which they judged Majority Group A and Minority Group B to be ‘friendly’ and ‘intelligent’. On each scale, higher scores indicated higher perception of ‘friendliness’ or ‘intelligence’ respectively, with lower scores indicating lower perception of ‘friendliness’ or ‘intelligence’ respectively.

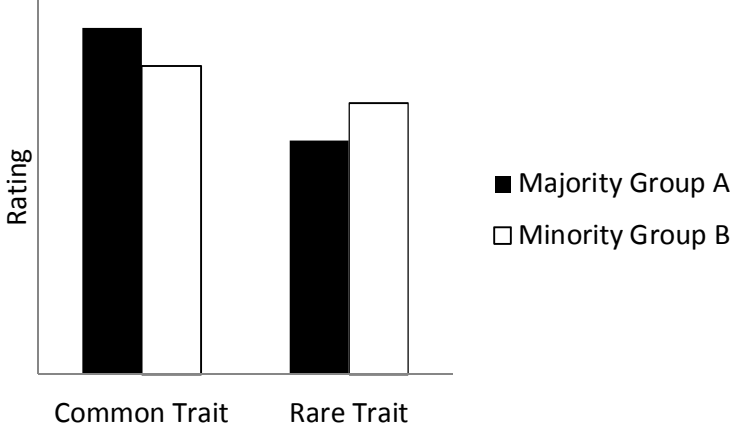
Group assignment task. All 18 statements (i.e., no repetition of statements) were presented again, without indicating group membership. For example, “MN, a member of Group ____, grasps new concepts easily.” In addition, 18 decoy statements, which participants had not seen before, were also presented. All 18 decoy statements

³ The maximum timeout of five seconds was empirically determined through a pilot study.

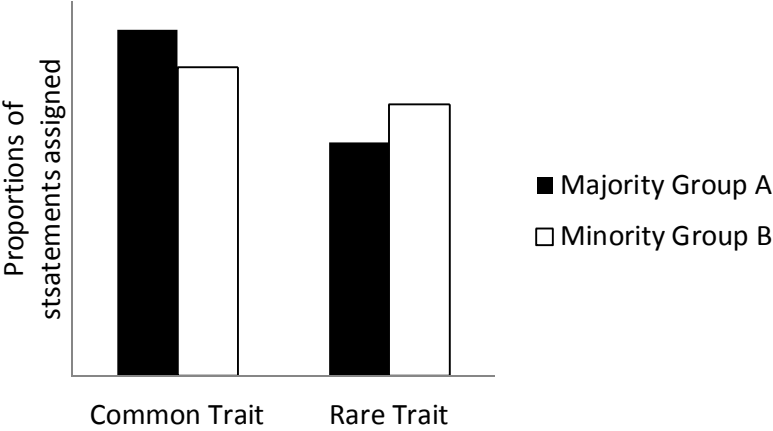
were of neutral meaning (Appendix B). For instance, “DL, a member of group _____, bought a new suit to wear to the office.” Together, all 36 statements were presented one at a time, in a random order. For each of the statements, participants were instructed to indicate if the statement belonged to *Group A*, by pressing on the ‘z’ key, or to *Group B*, by pressing on the ‘m’ key, or to *neither* by pressing on the space bar.

Data Analyses

Evaluative group impression. The overall evaluative group impression of IC was measured via the Trait Rating and Group Assignment task using an analysis of variance (ANOVA). Predictions for the Trait Rating task and the Group Assignment task are as shown in Figure 3.



(a) Trait Rating



(b) Group Assignment

Figure 3. Predicted results of IC as measured through evaluative measures.

(a) Participants would rate Majority Group A higher on the Common Trait, in comparison to Minority Group B, whereas Minority Group B would be rated higher on the Rare Trait, in comparison to Majority Group A. (b) A greater proportion of Common Trait statements would be assigned to Majority Group A, in comparison to Minority Group B; whereas, a greater proportion of Rare Trait statements would be assigned to Minority Group B, in comparison to Majority Group A.

Item-specific episodic memory. Latency scores from the group assignment task were analysed as a measure of participants' episodic memory. Specifically, latency scores refer to the time taken to assign a statement to a group, whereby faster assignment of a statement to a group, indicates stronger memory for the link between that statement (i.e., Common or Rare Trait) and that group (i.e., A or B).

As in the study by McConnell et al. (1994a), latency scores were analysed in terms of overall assignment (i.e., regardless if the statement was assigned to the accurate group), accurate assignment (i.e., statement was assigned to its source group) and inaccurate assignment (i.e., statement was not assigned to its source group). It has been suggested (McConnell et al., 1994a) and thus, was predicted in the current study that if participants demonstrated enhanced memory for Rare Trait behaviours belonging to Minority Group B, participants would have faster latency scores for these items in the overall assignment and in the accurate assignment, but not in the inaccurate assignment. Also, faster latency scores for Rare Trait behaviours belonging to Minority Group B, in both the accurate and inaccurate assignment were determined to indicate bias amongst participants in indiscriminately assigning all Rare Trait behaviours to Minority Group B (McConnell et al., 1994a). Latency scores in the current study were analysed using the ANOVA.

A number of researchers (i.e. Fiedler, 1993; Klauer & Meiser, 2000; Van Rooy et al., 2013) have raised the issue of response bias in the Group Assignment task and therefore, have suggested that a measure of participants' accuracy at the group assignment task should instead be used to determine true memory. As such, participants' accuracy in assigning statements to its source group (i.e., group assignment accuracy) was also analysed as a dependent variable.

Overall, the accuracy analysis in the current study was conducted in a manner, similar to that in the study by Van Rooy et al. (2013). Specifically, random effects were

modelled with the following multilevel logistic regression (Baayen, Davidson & Bates, 2008; Wright & London, 2009):

$$\text{logit}(\text{Pr}[\text{Accuracy}_{ij}]) = \beta_0j + \beta_1\text{Group}_j,$$

whereby, Accuracy_{ij} refers to accuracy on the i th trial for the j th participant, β_0j is the intercept and $\beta_1\text{Group}_j$ is a vector coding for the source group a statement is originally from (see also Van Rooy et al., 2013). Predicted results on the accuracy of group assignment are illustrated in the following Figure 4.

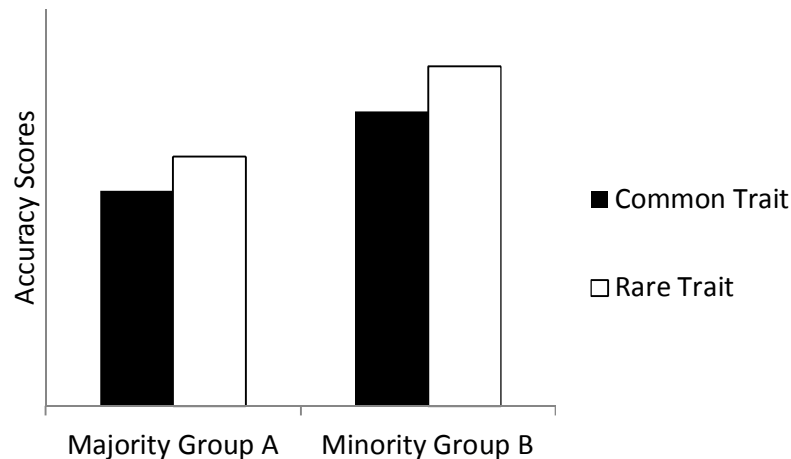


Figure 4. Predicted results for group assignment accuracy.

It was predicted that participants would be more accurate in assigning Minority Group B statements in comparison to Majority Group A statements, with higher accuracy in assigning Rare Trait statements than Common Trait statements to Minority Group B. This higher accuracy in assigning Rare Trait statements to Minority Group B would thus, indicate greater memory for Rare Trait behaviours of Minority Group B.

Additionally, a multilevel model approach to Signal Detection Analysis (SDA), which was developed by Van Rooy et al. (2013) to determine memory sensitivity, was also used. An advantage of using a SDA is its ability to distinguish mere guessing bias from true memory (Meiser, 2003). Moreover, by applying a multilevel model towards SDA, it has been argued to be a more accurate measure of memory in comparison to

threshold models (Klauer & Meiser, 2000) and analysing aggregate level data (DeCarlo, 1998; Wright & London, 2009) such as the traditional ANOVA, which could yield spurious results (Jaeger, 2008).

For this analysis, a binary dependent variable was created such that participants' responses corresponded to whether he or she had categorized a statement in the group assignment task as 'Old' (i.e., statement was presented before) or as 'New' (i.e., decoy statement). Specifically, the assignment of a statement to either *Group A* or *Group B* would indicate 'Old', whereas, the assignment of a statement as *neither* would indicate 'New'. 'Old' and 'New' responses were respectively coded as 1 and 0. It was expected that memories would vary amongst participants, and thus, the following multilevel logistic regression was modelled (Baayen et al., 2008; Wright & London, 2009):

$$\text{logit}(\text{Pr}[\text{SaysOld}_{ij}]) = \beta_0j + \beta_1\text{OldItem}_{ij}$$

with response_{ij} referring to the response on i th trial for the j th participants, β_0j referring to the intercept and $\beta_1\text{OldItem}_{ij}$ as a measure of accuracy (see also Van Rooy et al., 2013). The coefficient of 'OldItem' (i.e., whether an item was previously presented) is an indirect measure of memory sensitivity and its interaction with other variables (i.e., Group and Trait) indicates whether these other variables moderated accuracy (Wright & London, 2009). For instance, to test if Trait (i.e., Common vs. Rare) moderated accuracy; the main effect of Trait would be included into the model. If it improved the fit of the model, its interaction with $\beta_1\text{OldItem}_{ij}$ was determined. Predicted results are as shown in Figure 5.

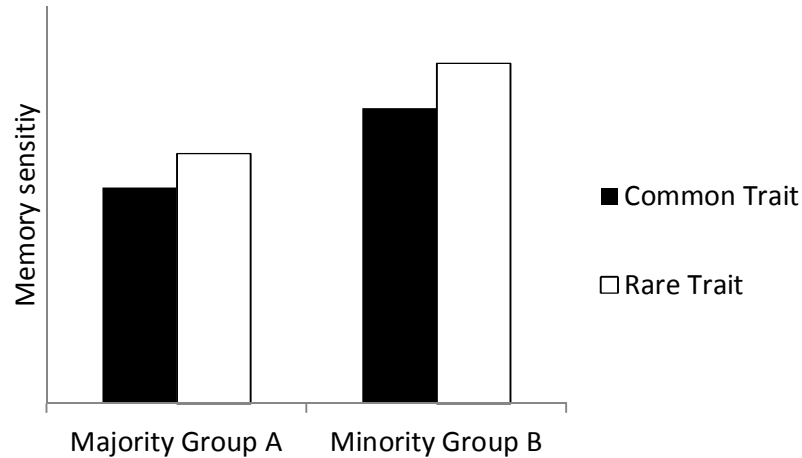


Figure 5. Predicted results for memory sensitivity as measured using a multilevel Signal Detection Analysis.

It was predicted that participants would say ‘Old’ to more statements from Minority Group B than Majority Group A, and to more Rare Trait statements than Common Trait statements; indicating better memory for Rare Trait behaviours of Minority Group B.

Results

Evaluative Group Impression

Trait rating. A 2 (Common Trait: Friendly vs. Intelligent) X 2 (Trait: Common vs. Rare) X 2 (Group: A vs. B) ANOVA, with repeated measures on the last two variables found that there were no significant differences in the data collected when the Common Trait was ‘friendly’ or ‘intelligent’⁴. As such, the main analysis on Trait Rating was conducted using a 2 (Trait: Common vs. Rare) X 2 (Group: A vs. B) Repeated Measures ANOVA (see Table 4).

⁴ Common Trait: Friendly vs. Intelligent, was included as a between-subjects, independent variable to determine if there was a significant effect of counterbalancing ‘friendly’ and ‘intelligent’ statements as the Common Trait.

Table 4

Results from 2 X 2 Repeated Measures ANOVA: Trait Rating

	<i>M</i>	<i>SD</i>	<i>F</i> (1, 97)	η_p^2	Power
Trait			8.99**	.085	.843
Common	7.97	1.42			
Rare	7.72	1.33			
Group			10.52**	.098	.895
A	7.99	1.36			
B	7.71	1.38			
Trait X Group			3.30	.033	.436
Common – A	8.23	1.35			
Common – B	7.71	1.46			
Rare – A	7.73	1.35			
Rare – B	7.71	1.32			

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

A significant main effect for Trait was found, such that the Common Trait was generally rated higher in comparison to the Rare Trait. The main effect of Group was also significant, whereby Majority Group A was rated higher in comparison to Minority Group B. Also, the interaction between Trait and Group revealed a marginally significant effect, $F(1, 97) = 3.30$, $p = .07$. Computing a 95% Confidence Interval (CI) around the obtained effect size ($\eta_p^2 = .033$) using the appropriate syntax (Smithson, 2003), found this interaction to plausibly contribute a unique variance as high as 12.7%. Thus, by analysing simple main effects using a paired samples t -test, it was found that Majority Group A was rated significantly higher, $M_{diff} = .520$, $CI_{95} [.192, .849]$ than Minority Group B on the Common Trait, $t(97) = 3.14$, $p < .01$, with a small to moderate

effect size, $d = .32$ ⁵. There were no significant differences in ratings of Majority Group A and Minority Group B on the Rare Trait, $t(97) = 0.13, p > .05$. These analyses suggest the significant main effects of Trait and Group to be mainly attributed to Majority Group A being rated significantly higher on the Common Trait (see Figure 6).

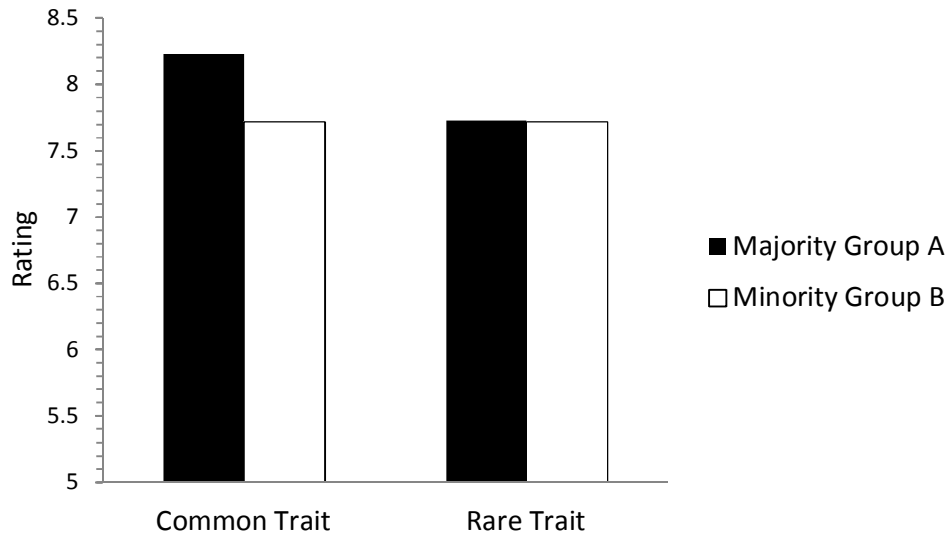


Figure 6. Results from the Trait Rating task.

Whilst there were no differences in the ratings of Majority Group A and Minority Group B on the Rare Trait, Majority Group A was rated higher on the Common Trait in comparison to Minority Group B. Thus, suggesting the Majority-Common Trait association to be the strongest amongst the evaluative links.

Group assignment. Analyses on the Group Assignment task were conducted excluding individual responses that had response latencies greater than three standard deviations from the overall mean latency ($M = 2.76, SD = 2.12$), in line with

⁵ Reported effect sizes in the current study are based on Cohen's (1988, p. 284 - 287) guidelines, where $d = .2$ - small effect, $d = .5$ - moderate effect and $d = .8$ - large effect.

recommended exclusion criteria (Field, 2013) and the study by McConnell et al., (1994a). As such, a total of 24 responses (1.36%) were not included in this analysis.

A 2 (Common Trait: Friendly vs. Intelligent) X 2 (Trait: Common vs. Rare) X 2 (Group: A vs. B) ANOVA, with repeated measures on the last two variables found no significant effect of the Common Trait being 'friendly' or 'intelligent'. Note however, that Levene's test of Individual Differences was not assumed for the Rare Trait statements that were assigned to Minority Group B ($p < .05$).

Subsequently, a 2 (Trait: Common vs. Rare) X 2 (Group: A vs. B) Repeated Measures ANOVA (see Table 5) yielded a significant main effect of Group, whereby a greater proportion of statements, were assigned to Majority Group A than to Minority Group B. Note the large effect size and power that complemented this obtained effect, in comparison to that obtained for the main effect of Trait and the interaction of Trait with Group. Hence, no other effects were found to be significant.

Table 5

Results from 2 X 2 Repeated Measures ANOVA: Group Assignment ^a

	<i>M</i>	<i>SD</i>	<i>F</i> (1, 97)	η_p^2	Power
Trait			.59	.006	.118
Common	.47	.22			
Rare	.48	.24			
Group			89.49***	.480	1.000
A	.58	.21			
B	.37	.20			
Trait X Group			2.80	.028	.381
Common – A	.60	.18			
Common – B	.34	.17			
Rare – A	.55	.23			
Rare – B	.40	.22			

Note. ^a Proportion of statements assigned was calculated using number of Common (or Rare) statements assigned, divided by total number of Common (or Rare) statements.

* $p < .05$, ** $p < .01$, *** $p < .001$

On the whole, results from the Group Assignment task resemble closely to that of the Trait Rating task, whereby the main effect of Group was found to be significant. However, an additional result demonstrated through the Trait Rating task, is the interaction of Majority Group A with the Common Trait. The implications of these combined results will be further explored in the discussion section.

Item-specific Episodic Memory

Group assignment latency. As with the analysis on the Group Assignment task, responses that were three standard deviations beyond the mean latency were excluded.

Also, test of normality on the latency scores found the distribution of latency scores to be significantly positively skewed, $Z_{\text{skewness}} = 25.7$, and thus, non-normal, $D(1740) = .125$, $p < .001$. Therefore, analyses on the latency scores of group assignment were conducted using its log transformation, which improved normality, $D(1740) = .031$, $p = .001$ and reduced skewness, $Z_{\text{skewness}} = -8.83$.

Mean latency scores (measured in seconds) for each participant were analysed in terms of overall assignment, accurate assignment and inaccurate assignment as indicated in the Method section. A 2 (Common Trait: Friendly vs. Intelligent) X 2 (Group: A vs. B) X 2 (Trait: Common vs. Rare) Mixed ANOVA was conducted for each of these assignments. In all three instances, the Common Trait variable was found to significantly interact with Trait, such that in all three analyses, response latencies were significantly faster for Rare Trait statements when the Common Trait was ‘friendly’, whereas response latencies were significantly faster for Common Trait statements when the Common Trait was ‘intelligent’ (see Table 6). Consequently, for each of the assignments, the main effects of Group and Trait, as well as their interaction were analysed within their respective 2 (Common Trait: Friendly vs. Intelligent) X 2 (Group: A vs. B) X 2 (Trait: Common vs. Rare) Mixed ANOVA.

Table 6

Interaction of Common Trait with Trait in 2 X 2 X 2 Mixed ANOVAs

	<i>M</i>	<i>SD</i>	<i>df_{error}</i>	<i>F</i>
Overall Assignment			81	24.32***
Friendly				
Common	.42	.12		
Rare	.33	.17		
Intelligent				
Common	.34	.17		
Rare	.37	.18		
Accurate Assignment			69	12.50**
Friendly				
Common	.40	.12		
Rare	.32	.17		
Intelligent				
Common	.33	.18		
Rare	.36	.19		
Inaccurate Assignment			17	7.86**
Friendly				
Common	.46	.15		
Rare	.31	.22		
Intelligent				
Common	.40	.22		
Rare	.41	.22		

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

As some participants had assigned, all Common Trait (or all Rare Trait) statements to a particular group, mean latency scores could not be calculated for those participants, and thus, there were missing values for some of the stimulus categories (i.e., Majority-Common Trait, Majority-Rare Trait, Minority-Common Trait, Minority-Rare Trait). Therefore, the analysis on overall assignment was conducted with $N = 83$ rather than 98. Also, Levene's test of Individual Differences in the analysis of overall assignment was not assumed for Common Trait statements that were assigned to Majority Group A ($p < .05$).

Specific to the overall assignment (see Table 7), a significant main effect for Trait was obtained but not for Group. Particularly, it was found that participants were faster in the assignment of Rare Trait statements than Common Trait statements. Besides that, due to the significant interaction effect of Group and Trait, analyses of simple main effects were subsequently conducted using two separate, 2 (Common Trait: Friendly vs. Intelligent) X 2 (Group-Trait: Group-Common vs. Group-Rare) Mixed ANOVAs for Majority Group A and Minority Group B respectively (see Table 8).

Table 7

Results from 2 X 2 X 2 Mixed ANOVA: Latency – Overall Assignment

	<i>M</i>	<i>SD</i>	<i>F</i> (1, 81)	η_p^2	Power
Group			.01	.000	.051
A	.36	.16			
B	.36	.17			
Trait			8.00**	.090	.798
Common	.38	.15			
Rare	.35	.18			
Group X Trait			10.01**	.110	.878

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 8

Results from 2 X 2 Mixed ANOVAs: Overall Assignment – Simple Main Effects

	<i>M</i>	<i>SD</i>	<i>df_{error}</i>	<i>F</i>	η_p^2	Power
Majority Group A			90	27.66***	.235	.999
Common	.39	.16				
Rare	.32	.18				
Minority Group B			87	.14	.002	.065
Common	.37	.15				
Rare	.37	.18				

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Results showed that participants were significantly faster in assigning Rare Trait statements than Common Trait statements to Majority Group A. Simple main effects conducted with Minority Group B however, found no significant differences in the response latencies for the assignment of Rare and Common Trait statements.

When analyses were specific to correctly assigned responses ($N = 71$, see Table 9), a significant interaction of Trait and Group was similarly found. Again, further tests using two separate, 2 (Common Trait: Friendly vs. Intelligent) X 2 (Group-Trait: Group-Common vs. Group-Rare) Mixed ANOVAs showed participants to have been significantly faster in the assignment of Rare Trait statements than Common Trait statements to Majority Group A. As before, simple main effects found no significant differences in response latencies for the assignment of Rare and Common Trait statements to Minority Group B (see Table 10).

Table 9

Results from 2 X 2 X 2 Mixed ANOVA: Latency – Accurate Assignment

	<i>M</i>	<i>SD</i>	<i>F</i> (1, 69)	η_p^2	Power
Group			.04	.001	.054
A	.35	.17			
B	.35	.17			
Trait			1.73	.024	.254
Common	.36	.16			
Rare	.34	.18			
Group X Trait			17.12***	.199	.983

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 10

Results from 2 X 2 Mixed ANOVAs: Accurate Assignment – Simple Main Effects

	<i>M</i>	<i>SD</i>	<i>df</i> _{error}	<i>F</i>	η_p^2	Power
Majority Group A			90	30.48***	.253	1.000
Common	.39	.16				
Rare	.31	.18				
Minority Group B			73	2.04	.027	.292
Common	.34	.15				
Rare	.37	.20				

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Finally, analysis specific to inaccurate assigned responses (N = 19, see Table 11) found only the main effect of Trait to be significant, whereby participants were significantly faster in assigning Rare Trait statements than Common Trait statements.

Table 11

Results from 2 X 2 X 2 Mixed ANOVA: Latency – Inaccurate Assignment

	<i>M</i>	<i>SD</i>	<i>F</i> (1, 17)	η_p^2	Power
Group			.06	.003	.056
A	.39	.22			
B	.40	.20			
Trait			5.13*	.232	.570
Common	.43	.19			
Rare	.36	.22			
Group X Trait			.05	.003	.055

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

To summarize, a significant interaction effect of Trait with Group was found in the overall and accurate assignment, but not in the inaccurate assignment. This would then suggest the found interaction of Majority-Rare Trait to not be due to a biased assignment of Rare Trait statements to Majority Group A, but rather as a result of enhanced memory for this association. Although rarely found in the research literature on IC, this significant Majority-Rare Trait association was found to occur with large effect sizes and power (see Tables 9 and 11). The implications of this finding are further considered in the discussion section.

Group assignment accuracy. Analysing the logit of scores is a popular measure of accuracy (Van Rooy et al., 2013), and thus the current study analysed the natural logarithm of the ratio of the odds in assigning an item to Group X when the item is from Group X, over the odds of assigning an item to Group X when the item is not from Group X (see also, Van Rooy et al., 2013). In simple terms, participant's ability to correctly assign Common and Rare Trait statements to their source groups was analysed

as a measure of accuracy. The generalized linear mixed model was fit using the Laplace method of approximation, which is the default in the lme4 package (Bates, Maechler & Dai, 2008).

The restricted model was firstly defined with only Participants as a random factor. Then, by adding the terms, Trait and Group into the model, it significantly increased the fit of the model, $X^2(2) = 17.48, p < .001$. Results from the analysis demonstrated better accuracy for Majority Group A, $\beta_1 = -.48, p < .001$, with no significant differences for the Trait term.

Subsequently, the interaction term of Group with Trait was added into the model, which significantly improved the fit of the model, $X^2(1) = 10.13, p < .01$. By introducing this interaction term, the main effect of Group became non-significant, whilst the main effect of Trait had then become significant, $\beta_2 = .29, p < .05$. Note however, that this effect should be interpreted in respect to the significant interaction between Group and Trait, $\beta_3 = -.78, p < .001$ (see Figure 7).

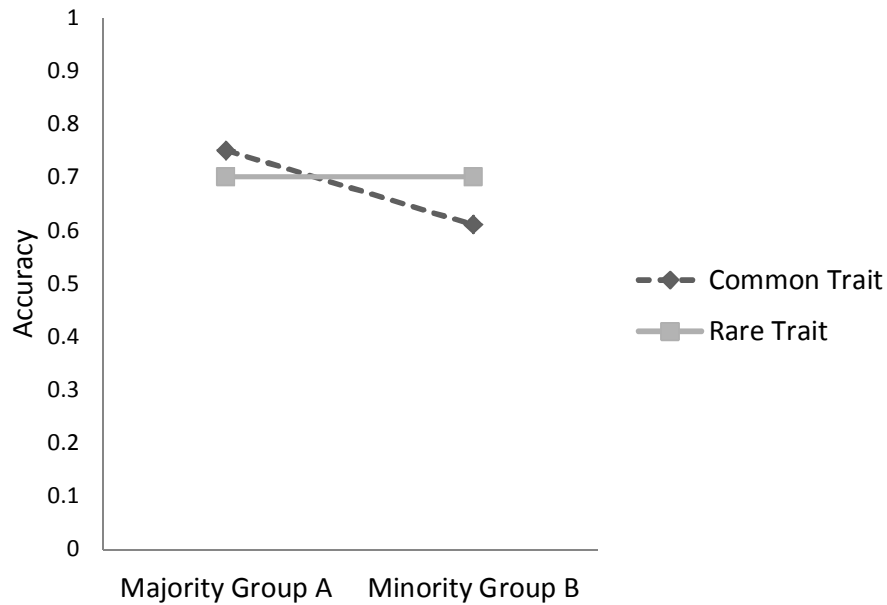


Figure 7. Interaction of Group with Trait on accuracy scores.

Whilst no significant differences were found for the accuracy in assigning Rare Trait and Common Trait statements to Majority Group A, Rare Trait statements were found to be assigned more accurately to Minority Group B than Common Trait statements.

As such, further analysis using a binomial logistic regression was conducted to determine the significance of accuracy for each Group with Trait as the predictor. Results showed that the odds of a participant accurately assigning a statement to Majority Group A is not significantly different when the statement is of a Rare Trait or of a Common Trait, $Exp(B) = 1.299$, $CI_{95} [.992, 1.700]$, $p > .05$. Conversely, the odds of a participant accurately assigning a statement to Minority Group B is .65 times higher when the statement is of a Rare Trait than when it is of a Common Trait, $CI_{95} [.450, .938]$, $p < .05$. These results hence suggest better accuracy for Rare Trait statements belonging to Minority Group B.

Thus far, it is apparent that results obtained from the analysis of group assignment accuracy are the reverse to that found from the analysis of group assignment

latency scores. Inferences drawn from these combined results are further explored in the discussion section.

Signal detection analysis. Neutral statements (i.e., decoy items) were included in the Group Assignment task to determine participants' ability in distinguishing an 'Old' item (i.e., statement was presented before) from decoy items as a measure of memory sensitivity (see also Van Rooy et al., 2013). As with the analysis on Group Assignment accuracy, the Laplace model was used to fit the models.

Expectedly, results from this analysis revealed participants to have said "Old" more often towards statements they have seen before, in comparison to decoy statements, $\beta = 7.06, p < .001$. Further analyses however, found no significant memory advantage for Group ($p > .05$) or Trait ($p > .05$). Instead, results obtained showed close to perfect performance amongst participants, such that hit rates (i.e., correctly assigned statements) were almost 1 for every participant. This therefore, suggests a ceiling effect, which implications would be further considered in the discussion section.

Discussion

The aim of the current study was to further test the MCM (Van Rooy et al., 2003) predictions regarding the use of evaluative and item-specific information in an IC design using two independent trait dimensions, rather than one evaluative dimension. Specifically, where past research (Van Rooy et al., 2013) investigated the competition property between the evaluative and episodic links within the MCM, the current study allowed the testing of a number of novel predictions by the MCM regarding the competition between *similar* links, more particularly between the evaluative links encoding the Common and Rare Trait behaviours. The focus thus is on how the different types of information (i.e., evaluative and item-specific) work together and/or independently in producing a particular IC effect. We will start by looking at judgements that are thought to be dependent on evaluative information.

Evaluative Group Impression

The current study firstly hypothesized that Majority Group A would be more strongly associated to the Common Trait in comparison to Minority Group B, and that this would be apparent in measures thought to rely on evaluative information. Results from the Trait Rating task provided clear support for this hypothesis, while results from the Group Assignment task provided partial support.

Firstly, results from both the Trait Rating and Group Assignment tasks found evidence for the main effect of Group, such that Majority Group A was found to have greater association to both the Common and Rare Trait in comparison to Minority Group B. Results from the Trait Rating task however, additionally found Majority Group A to be associated to the Common Trait. As such, the combination of results from the Group Assignment and Trait Rating tasks in respect to the first hypothesis, suggest an overall greater learning of Majority Group A, with the propensity to associate Majority Group A with the Common Trait.

The second hypothesis stated that the Rare Trait would be more strongly associated with Minority Group B in comparison to Majority Group A; as a result from the greater blocking of the Majority-Common Trait evaluative link on the Majority-Rare Trait evaluative link. There was very little support for this hypothesis, such that associations formed with Majority Group A was consistently stronger than that of Minority Group B.

Overall, the combined results in respect to hypotheses one and two suggest that participants were able to develop an accurate impression of Majority Group A, but not of Minority Group B. More particularly, results from both the Trait Rating and Group Assignment task suggest participants to have learnt the true associations between Majority Group A with the Commonly and Rarely occurring Trait. This was not the case for Minority Group B— both in the Trait Rating and Group Assignment task. It is likely

that this confusion about Minority Group B, together with the more established Majority–Common Trait association (as found in the Trait Rating task), led to the “illusory correlation” between Majority Group A and the Common Trait.

The results also suggest that the expected competition effects between the Common Trait and the Rare Trait, which would have resulted in a stronger Minority–Rare Trait evaluative link, did not occur. A possible explanation is that the Majority–Common Trait link blocked the development of all other links in the evaluative network. In other words, participants developed stereotypical impressions in which Majority Group A was clearly associated to the Common Trait, and discarded any information regarding Minority Group B that attenuated this impression. Hence, the blocking effect amongst evaluative links predominantly occurred between *Groups*.

These findings thus partly support the MCM (Van Rooy et al., 2003), as information about Majority Group A blocked all information associated with Minority Group B due to its relatively greater statistical frequency. However, contrary to predictions, including two evaluative dimensions in the current design did not lead to a blocking effect between the Commonly occurring and Rarely occurring Trait within each Group. This is illustrated by comparing Figure 2 with Figure 8, which graphically summarizes the findings of the evaluative measures.

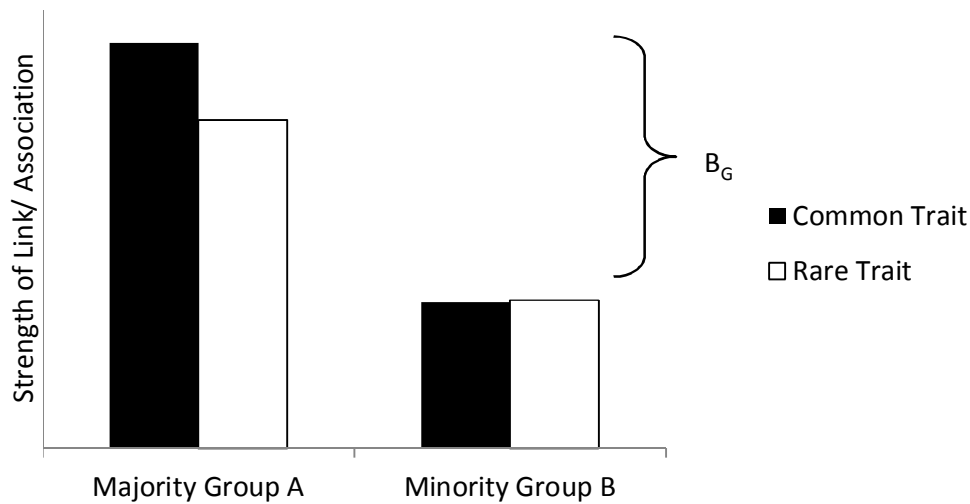


Figure 8. Results found on the evaluative links of IC.

B_G = Blocking effect of Majority Group A on Minority Group B.

As there is greater information on Majority Group A, its evaluative links are stronger; thus, blocking those of Minority Group B. At the same time, a slight blocking effect of Majority-Common Trait on Majority-Rare Trait was found, whilst no such blocking effect had occurred between the Minority-Common Trait and Minority-Rare Trait.

Therefore, evaluative links of IC were found to be predominantly based on the *majority group* than the minority group.

In the study by Van Rooy et al. (2013) its findings on the evaluative links of IC demonstrated increased association of a group with the infrequent, undesirable behaviours as group size decreased (Van Rooy et al., 2013). However, because this finding was determined based on evaluative judgments on desirability, which is one-dimensional, it is difficult to determine if one group was perceived to be more desirable than the other, less desirable than the other or both. More specifically, the prototype of Group-Behaviour links would have been unclear. Thus, the perceived IC between a

minority group and the rarely occurring undesirable behaviours, would have masked the IC between a majority group and the commonly occurring desirable behaviours.

On the contrary, in the current study where evaluative group impressions were measured on two evaluative dimensions (i.e., friendliness and intelligence), partial support was found for the Majority-Common Trait association, but not for the Minority-Rare Trait association. This would thus, imply the findings on evaluative group impression in the study by Van Rooy et al. (2013) to mean that a group is perceived as more desirable with increasing group size. This is in contrast to the proposed interpretation that a group is increasingly perceived as undesirable, as group size decreases (Van Rooy et al., 2013).

The obtained current set of results also has implications for other accounts of IC. Firstly, our results are partially consistent with those of Sherman et al. (2009). In their study, the results from the Trait Rating task only found significant results for the Rare Trait, in that participants associated the Rare Trait more with the minority group as compared to the majority group. Our results however, found a significant difference for the Common Trait, in that participants associated the Common Trait more strongly with the majority group as compared with the minority group. Perhaps somewhat ironically, our findings on the evaluative links, are more consistent with the AT (Sherman et al., 2009), whereby the AT predicts learning to first occur for the majority group, leading to a representation of the majority group in terms of its typical features (i.e., Common Trait). Results from the current study provide support for this.

These results are also consistent with the Information Loss Account (ILA, Fiedler, 1991; 1996). Similar to the MCM and the AT, the ILA would explain the current findings to be due to perceivers' superior information processing of the majority group, leading to more accurate judgments for the majority group. Furthermore, the tendency to form a Majority-Common Trait association could be suggested to arise due

to the greater availability of information regarding the commonly occurring behaviour of the majority group (Rothbart, 1981). The finding of a Majority-Common Trait association as an evaluative link is also supported by a past study (Manis et al., 1993), which similarly found the more available information (i.e., Majority-Common Trait) to have implications from an evaluative perspective.

Item-specific Episodic Memory

In terms of encoding item-specific information within the MCM, it was predicted that enhanced memory would occur for Minority Group B in comparison to Majority Group A, with advantage in memory for Rare Trait behaviours over Common Trait behaviours. Amongst the three analyses on item-specific episodic memory, only those from participants' accuracy in the Group Assignment task were found to support this hypothesis. In addition, analysis of the group assignment latency scores found results that contradicted this hypothesis. Specifically, participants were shown to have assigned Rare Trait statements to Majority Group A significantly faster than Common Trait statements; whereas they showed no significant differences in the time taken to assign Common and Rare Trait statements to Minority Group B. This suggests that, contrary to predictions, participants appeared to show superior item-specific memory for Majority-Rare Trait behaviours.

Associations found through the analysis of latency scores in an 'overall assignment' (i.e., regardless if the assignment was accurate) and 'accurate assignment', but not in 'inaccurate assignment', are said to be unattributed to bias (i.e., participants indiscriminately assigning a behaviour to a specific group; McConnell, 1994a). Our results on the Majority-Rare episodic link show this, implying this association to not be due to bias. Nonetheless, the measure of latency scores has been argued by several authors (Fiedler, 1993, Klauer & Meiser, 2000; Van Rooy et al., 2013) to not be a particularly direct measure of true memory.

As such, in addition to the traditional reaction time (i.e., latency scores) analysis, we also applied a multilevel analysis to group assignment data, which has been argued to be more reliable (Van Rooy et al., 2013). Consistent with MCM predictions, this analysis showed that assignment accuracy for the Minority-Rare Trait association was greater than for the Minority-Common Trait association. Whereas with Majority Group A, the accuracy in assigning Common and Rare Trait statements were not found to be significantly different. However, a multilevel approach to signal detection analysis failed to provide any conclusive evidence. A closer inspection of the number of ‘hits’ (i.e., accurately discriminate ‘Old’ items’ from decoy items) to ‘misses’ (i.e., inaccurately discriminate between ‘Old’ items and decoy items) showed that participants demonstrated almost perfect performance, with a very high number of ‘hits’. This suggests that the failure to find any actual differences in item-memory was largely due to a ceiling effect. We discuss possible reasons under Limitations.

In sum, findings on item-specific episodic memory were thus contradictory: While the analysis on latency scores suggests superior memory for the Majority-Rare Trait association, the accuracy analysis on group assignment however, suggests it to be the Minority-Rare Trait association. As such, in respect to item-specific episodic memory, the proposed hypothesis is partially supported.

The finding of a Minority-Rare Trait association as an episodic link provides support for the MCM, which assumes the Minority-Rare Trait association to be the strongest amongst the episodic links of IC. This finding is also in line, with Van Rooy et al. (2013), which used a similar accuracy analysis on group assignment; and also with the Distinctiveness Based Model (DBM; Hamilton & Gifford, 1976), which assumes enhanced encoding of co-occurring infrequent items (i.e., minority group, rare traits).

On the other hand, the finding of superior item-specific episodic memory for Majority-Rare Trait behaviours is one that lacks empirical support in the research

literature on IC. Previous studies have typically found a Minority-Rare Trait association (Johnson & Mullen, 1994; McConnell et al., 1994a). Although inconstant with previous studies, the large effect size for this result in our study suggests that this is in fact a genuine effect that warrants further investigation, particularly as previous studies used the classic one-dimensional IC design.

It is difficult to provide a coherent explanation for the contrary results in terms of item-specific memory. However, it is possible that, in the current design with two separate dimensions, perceivers more efficiently encoded in memory distinct (i.e., rarely occurring) characteristics of *both* the majority and minority group. This is consistent with the MCM prediction that stronger evaluative links for Common Trait behaviours (due to its greater statistical frequency) leads to weaker evaluative links for Rare Trait behaviours and thus, stronger episodic links for Rare Trait behaviours. The apparently contradictory results (i.e., Majority-Rare and Minority-Rare) however, might arise from the different measures tapping into different levels of information used to form a judgment: When memory was measured through a relatively more reliable analysis (i.e., group assignment accuracy), the resulting Minority-Rare Trait episodic link demonstrates (more reliably) *true* memory; whereas when memory was measured through an analysis (i.e., group assignment latency), which has been argued to be susceptible to response bias (Fiedler, 1993, Klauer & Meiser, 2000; Van Rooy et al., 2013), the resulting Majority-Rare Trait association might instead imply an evaluative link rather than an episodic link. This is based on the MCM assumption that, response bias results from the encoding of evaluative information rather than item-specific information, which instead reflects true memory (Van Rooy et al., 2003). Therefore, further studies are needed to determine the extent to, which the finding of the Majority-Rare Trait association is one that is due to response bias (i.e., evaluative information) or true memory (i.e., item-specific information).

General Discussion

Overall, via the evaluative links of IC, results of the current study found evidence of a Majority-Common Trait association; whereas in terms of the episodic links of IC, the results were less straightforward – with an accuracy analysis confirming MCM predictions, while latency analysis provided mixed support.

The assumed principle of the competition property between the evaluative and episodic links is supported, such that stronger evaluative links block its corresponding episodic links. When results are specific to evaluative information, it appears that, as predicted by the MCM, the stronger evaluative links for Majority-Common Trait did indeed block the development of other links in the network (see Figure 8). As a result, the weaker evaluative links for Rare Trait behaviours led to the stronger development of its corresponding episodic links, as demonstrated through the findings of the Minority-Rare and Majority-Rare episodic links in the current study (see Figure 9). Overall, our results thus suggest, that when forming an overall evaluative group impression, behaviours are compared between a majority group and a minority group, whereas when encoding item-specific episodic information, rare trait behaviours are contrasted with common trait behaviours.

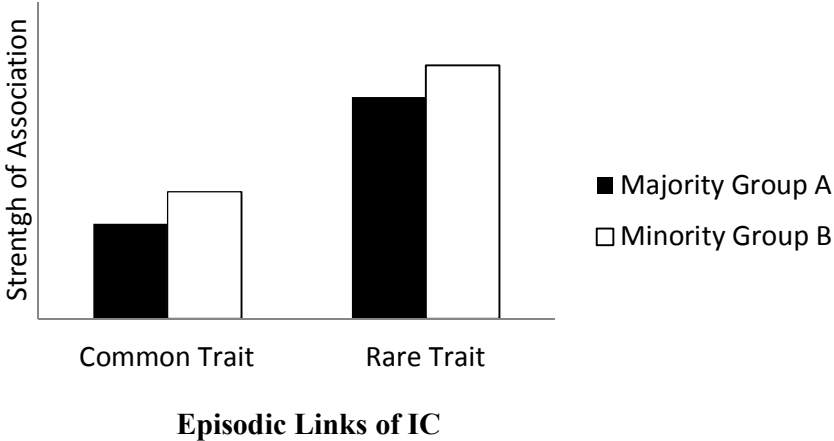
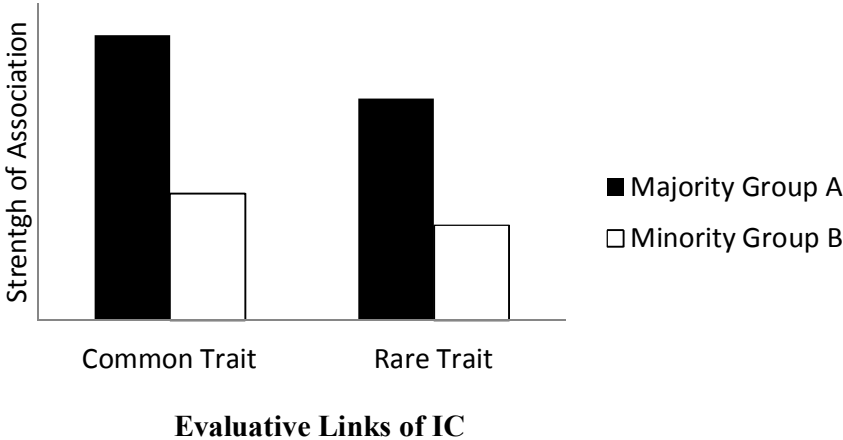


Figure 9. Competition property as implied by results of the current study. Specific to evaluative links, competition primarily occurred between Groups, whereby Majority Group A blocked those of Minority Group B. Between the evaluative and episodic links however, competition was found to occur mainly between Traits, whereby stronger evaluative links for Common Trait behaviours led to stronger episodic links for Rare Trait behaviours.

Our results provide some support for the AT, as similar to Sherman et al. (2009) we found both a Majority-Common Trait association, though marginally found in Sherman et al., (2009), and a Minority-Rare Trait association. However, additionally to this, the current study was able to demonstrate the finding of the Majority-Common Trait association as an evaluative link and the Minority-Rare Trait association as an episodic link. Thus, the current study, by means of the MCM, is able to explain cognitive processes that may underlie the attention shifting mechanism; which is assumed by the AT, but not in terms of its cognitive processes. With the attention shifting mechanism, it is suggested that to distinguish a minority group from a majority group, attention is shifted to the rare traits in the minority group, which in turn causes the Minority-Rare Trait association to be stronger than the Majority-Common Trait association (Sherman et al., 2009). Extending from this, findings from the current study suggest that the blocking of the Majority-Common evaluative link on its episodic link, which leads to stronger episodic memory for the Minority-Rare Trait association; is what that causes the shift in attention from the Majority-Common to the Minority-Rare association.

On the whole, it has been suggested that although both the evaluative and episodic links play a role in forming the IC effect, participants rely on evaluative links in making judgments as these links are more easily accessible (Van Rooy et al., 2013). On the contrary, results from the current study suggest participants to rely on the interplay of evaluative and episodic links in forming judgments. Specifically, our results suggest evaluative links to lead perceivers into making judgments that are accurate in terms of the majority group, though with the tendency to associate the majority group with the commonly occurring trait. On the other hand, the encoding of the Minority-Rare Trait association in memory leads perceivers to report rarely occurring behaviours when making judgments on a minority group. As such, together, both the evaluative and

episodic links of IC lead perceivers to report judgments on a majority group and a minority group respectively.

Following this, the findings of the current study reinforces the suggestion of Van Rooy et al., (2013), that the contradictory results from past studies are likely to be due to the different links at which IC is measured. Particularly, past studies (Fiedler, 1991; 1996; Klauer & Meiser, 2000; Sanbonmatsu et al., 1986) that have found the IC effect to be due to a Majority-Common Trait association, would have measured IC based on evaluative links, whereas past studies (Hamilton & Gifford, 1976; Johnson & Mullen, 1994; Smith, 1989; Stronessner et al., 1992) that have found evidence of the Minority-Rare Trait association would have measured IC based on episodic links. Therefore, the current study supports these past contradictory findings in providing a more conclusive explanation of the IC effect.

As mentioned earlier, the current study additionally found a Majority-Rare association as an episodic link. From the perspective of the AT, this finding would not be able to be accounted for. This is because, the attention shifting mechanism suggests the majority group to first be learned in terms of its typical features (i.e., Majority-Common Trait), of which then, the learning of a subsequent minority group is in terms of features that distinguish it from the majority group (i.e., Minority-Rare Trait). Based on this, it would thus be illogical for attention to be redirected to the rare traits of a majority group. Other accounts of IC would also have difficulty in explaining this finding: The DBM (Hamilton & Gifford, 1976) which suggests enhanced memory for co-occurring distinctive (i.e., infrequent) items, would not be able to explain why rare traits of a *majority* group is enhanced in memory. Conversely, Rothbart's (1981) suggestion of availability would not be able to account for why *rare* traits of a majority group are more available in memory. From the perspective of the MCM however, the Majority-Rare Trait association could plausibly root from the encoding of evaluative

information (rather than item-specific information), as the measure from which this association was found, has been argued to be susceptible to response bias (i.e., evaluative link). Nonetheless, as this is a novel finding, more studies are required to determine the nature of this association and its implications on IC. This will be further elaborated under Future Research.

Practical Implications

The finding of the Minority-Rare Trait association as an episodic link is critical in suggesting the basis of minority discrimination to lie in the memory (i.e., episodic memory) of a perceiver. This thus, implies the need for perceivers to be aware that discriminating judgments made on a minority group could very possibly be due to its stronger encoding of item-specific information in memory.

One specific area in which this can be practically applied is in the area of law enforcement, whereby minority racial groups are usually targeted by law enforcers. For instance, the 2012 U.S. Justice Department Data showed Black men to be six times more likely than Whites to be arrested (Edwards, 2014). Similarly in Australia, as of June 2010, it was recorded that the age-standardized rate of imprisonment for Indigenous prisoners was 14 times higher than that for the non-Indigenous population (Australian Bureau of Statistics, 2012). Hence, psycho-education on the faulty memory that may underlie minority discrimination, could be introduced as part of the training program for law enforcers, to curb the tendency to 'illusory correlate' minority racial groups with criminal behaviour (i.e., false allegations).

Similarly, psycho-education on the mechanisms underlying IC would be useful amongst society in general. Such that, it may create the awareness of being mindful, in terms of biasedly recalling specific events from memory, when making stereotypical and discriminating claims about a specific group.

Limitations

As mentioned earlier, results from the multilevel SDA found participants to have performed extremely well. Statements in the current study were repeated to participants as it has been suggested to ensure the encoding of information on an episodic trace (Van Rooy et al., 2013). However, it is likely that the repetition of statements in the current study led to exceedingly well encoding of information in memory, resulting in a ceiling effect in the multilevel SDA. It is also probable that the discriminatory features of ‘Old’ and decoy items were too obvious to enable an elaborate SDA. In other words, participants might have found it exceptionally easy to differentiate between a decoy item and an ‘Old’ item.

Future Research

Following from the previous section, future studies conducting a SDA, are suggested to use an alternative form of decoy statements that would create only subtle differences between them and the ‘Old’ items. Perhaps, the use of statements, which imply the same meaning as the Traits (i.e., friendliness and intelligence) but have not been shown in the group assignment task, would more thoroughly test participants’ ability to distinguish ‘Old’ items from decoy items.

Moreover, with the novel finding of a Majority-Rare Trait association, future studies are suggested to focus on measures discriminating between response bias and item-specific memory (similar to the current study). A replicated finding of this association in future studies would enable the exact nature of this association (i.e., evaluative vs. episodic link) to be determined with more certainty.

In the current study, particularly in the analysis on group assignment latency scores, it was found that the Trait itself (i.e., friendly or intelligent) had an impact on response time, suggesting that the type of Trait used in an IC design could have implications in ICs that are formed. As such, an avenue for future research would be to

use Traits that are socially meaningful in current contexts of stereotypes and minority discrimination so as to provide a more ecologically valid understanding of IC. These Traits may include, ‘alcoholism’ and ‘violent behaviour’, which are common stereotypes of the Aboriginal population (i.e., a minority group) in Australia (Korff, 2014).

Besides that, it would also be worth investigating if cognitive load would have an effect on IC; as in a realistic social environment, no two events (i.e., Group and Trait) occur in isolation. Instead, a perceiver is vulnerable to a variety of distractions, which may even enhance the occurrence of IC. As such, by conducting a study in which participants are required to listen to a narrative (or other tasks alike) whilst reading common and rare statements about a majority and minority group, a more realistic effect of IC may be determined.

Conclusion

Illusory correlation is a social-cognitive process of associating two events when in reality that association does not exist (Chapman, 1967). Various theories and models have been proposed to explain the mechanisms of IC, but have resulted in contradictory findings. The current results however, do not allow to discount particular models: There is some clear support for the MCM of IC (Van Rooy et al., 2013), while the results are also partially consistent with alternative accounts, such as the AT, ILA and the DBM.

The current study further illustrates how IC emerges from the interplay of evaluative and item-specific information. Specifically, results suggest that, based on evaluative information, perceivers were able to develop a more “accurate” impression of the majority group, that more clearly encoded the preponderance of common trait behaviours. In terms of item-specific episodic memory, results suggest perceivers to have stronger memory for rare trait behaviours of the minority group. The added finding of enhanced memory for rare trait behaviours of the majority group, is one that is novel in the research literature of IC; and thus, future studies are urged to explore the root of

this association (i.e., evaluative or item-specific information) and the implications this association might have on the IC effect.

To conclude, results from the current study has further supported the MCM in confirming that IC results from a complex process, where different types of information (i.e., evaluative and item-specific) differentially contribute to the phenomenon. In relating the current findings to the reality of Social Psychology, the current study points to a need to further investigate how different types of information can be used in combatting the development of prejudice.

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Appendix A

Intelligent and Friendly Statements Used in the Current Study

'Intelligent' statements:

- "... scored highly on the year 12 HSC exams." *
- "... drew up blueprints for building a sailboat." *
- "... impressed the lecturer by asking perceptive questions." *
- "... understands information regarding the stock exchange." *
- "... pointed out an error in a textbook." *
- "... can name all the elements on the periodic table."
- "... knows how to recover deleted files from a hard drive."
- "... can recite the Greek alphabet off by heart."
- "... grasps new concepts easily."
- "... learnt a skill by only reading a manual hand guide."
- "... repaired a light bulb with no assistance."
- "... is an expert at using Excel."
- "... can calculate customer's total bill in their head when working at the cashier"

'Friendly' statements:

- "... talked with the couple in line behind him at the store." *
- "... offered some directions to some tourists who looked lost." *
- "... introduced the new person to the others standing around." *
- "... offered a stick of gum to a man sitting next to him." *
- "... showed a foreign exchange student around campus." *
- "... helped the boy fix up his bicycle and pump up the tires." *
- "... gave a ride to a guy who had fallen off his bicycle." *
- "... offered his umbrella to a lady waiting at the bus stop." *
- "... helped a lady pick up the packages she dropped." *
- "... returned a wallet he found to the owner." *
- "... drove a handicapped man to the shopping mall." *
- "... offered to help a friend move houses."
- "... offered to get the new comer of the party a drink."
- "... cheered for their friend in a swimming race."
- "... offered a friend a lift to the shop."
- "... helped a friend complete a survey."

* Adapted from the study by Sherman et al. (2009)

Appendix B

Decoy Statements Used in the Group Assignment Task

- "... bought a new suit to wear to the office."
- "... watched a late movie on television."
- "... ate a bacon and cheese hamburger for lunch."
- "... took a short nap in the middle of the afternoon."
- "... took his car to the carwash to get it cleaned."
- "... went shopping for old furniture."
- "... took a leisurely walk around the block."
- "... hung a new print on the wall in his room."
- "... threw away some junk that had been lying in the basement."
- "... paged through an old album of his high school days."
- "... took his bike to the shop to get it painted."
- "... straightened up his apartment and patio for an hour."
- "... put an album on to relax."
- "... stretched out on the couch to read a magazine."
- "... made some fresh orange juice for breakfast."
- "... took a short nap in the middle of the afternoon."
- "... rearranged the living room furniture."
- "... washed the dishes after dinner."

Appendix C

Participant Information Sheet

Thank you for your participation in this study. The primary researchers for this study are Alex Roach, Aretta Kummar and Eric Tran, under the supervision of Dr. Dirk Van Rooy, from the Research School of Psychology, The Australian National University. Ms. Alex Roach and Ms. Aretta Kummar are both Honours students at the School of Psychology at the ANU and Mr. Eric Tran is a PhD candidate at the School of Psychology at the ANU.

Illusory Correlation and Learning

This study investigates the processes behind group perception. We are particularly interested in the various factors and mechanisms that underlie how individuals perceive groups and their members, as well as the processes underlying impression formation. You will be presented with behavioural statements of members of various social groups. You will then be asked questions based on these statements. Detailed instructions will be given during the actual study. The study should not take more than 30 minutes, and upon completion of the study you will be provided with a debrief sheet providing more information on the study. Participants are eligible for either half an hour of psychology research credit, or \$5 to compensate them for their time.

Your completion of the study for research purposes is completely voluntary and participation in the study will be kept confidential. You are free to withdraw from this study at any time without penalty or risk of adverse effects. When you withdraw, your data collected will be removed.

All data will be securely stored at the ANU School of Psychology in an electronic format on password protected machines for a period of 5 years from any publication based on the results, and all materials will remain confidential as far as the law allows. No identifying personal information will be collected and individual data will only be identifiable by use of computer generated tag thus ensuring confidentiality. The data collected will only be accessible to the primary researchers and the supervisor of this project. The aggregated data generated from these responses and the following analyses will be published in scientific journals and/or books. Individual participant data will be kept confidential, and will not be published. The data will be deleted after the stated storage period.

There are no known risks associated with participating in this study. A summary of the results and findings can be requested from the researchers upon the projected completion of the project in November 2014. Please do not hesitate to ask the researcher any questions or discuss any concerns you may have. Contact details have been provided below should you wish to contact us at a later date.

The ethical aspects of this study have been approved by the ANU Human Research Ethics Committee (protocol number: 2014/337). You may write to the Human Ethics Officer if you have any complaints about this study, or any queries which the researcher and supervisor are unable to answer.

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Appendix D

Instructions to Participants

Instructions at the start of the experiment:

"Welcome, and thank you for taking part in this group perception study. You will be asked to complete a few tasks related to how we process and retain information. Please read and understand the following before proceeding.

Participation in this study is completely voluntary, and you are free to withdraw at any time during the study with no consequences. All data collected is confidential and will be stored securely, accessible only by the researchers. This data may be published, but individual contributions will remain anonymous. You cannot and will not be linked to any data you provide.

If you need assistance or have any doubts during the experiment, please raise your hand to let the experimenter know.

If you have understood the above, and consent to taking part in the study and having your experimental data used for research purposes, please press the space bar to begin."

Instructions specifically prior to Block 2 (i.e., current study):

"In this section, you will be asked to read a series of statements about members of two groups, A and B.

Read the statements presented on the screen. Pay attention to the statements, reading each one carefully. The statements will change automatically after a short period of time, or you can press the space bar to move on to the next statement. There will be further instructions after all statements have been presented. "

Appendix E

Inquiry of Consent for the use of Data

"I have read the information sheet, and do give consent for the data collected from my participation in this study being included in future analysis and for the results of this study to be published in future scientific journals and books."

yes no

Appendix F

Debriefing Statement

Thank you for participating in this research. We would like to assure you again that your responses are completely anonymous.

Illusory Correlation (IC) is a phenomenon, defined in social psychology to be where a relationship between a group and a behaviour is assumed, when in reality they are not related. In real life, this is linked to group processes such as stereotyping and prejudice. In the context of the experiment, you were presented with a majority group (Group A) and a minority (Group B), while rare trait and common trait behaviours implied friendliness or intelligence (depending on the condition you were in).

This study was interested particularly in how:

- learning across the three blocks affected IC from an evaluative perspective
- episodic memory for each particular statement in the second block affected IC.

It should be noted that there was no actual relationship between the groups and the traits. However, previous research has suggested a learning curve to occur across the three blocks, whereby there will be an absence of IC in the first block, followed by an IC effect in the second block and the learning of the true proportions of traits between the groups by the third block.

Whilst this has been studied in the past, this has never been investigated when IC is measured on two separate dimensions (i.e., friendliness and intelligence).

In all three blocks of the study, you were asked to provide an evaluative rating of the two groups, and to also match behavioural statements to groups you thought they belonged to. Specifically in the second block, you were also asked to determine if there were statements you had not seen before (decoy statements), to measure memory.

We hypothesize that in the first and third blocks, there would be no difference between the two groups in the evaluative ratings and the group assignment task. However, in the second block, where we assume IC to have occurred, we hypothesize that the majority group will be more strongly associated with the common trait, whereas the minority group would be strongly associated with the rare trait. We also hypothesize for the second block, that participants would have better memory for minority group statements and rare trait statements."

Your experimental data will remain completely anonymous, and only aggregated data will be reported and published.

If you experience any discomfort or distress upon completion of the study, please inform the researcher. Please also be aware that the ANU offers a free and confidential counselling service to all current ANU students and staff, should you require them. More information is available at <http://counselling.anu.edu.au>.

Any queries and concerns can be directed at the researcher or supervisor. Thank you again for your time; your participation is greatly appreciated.

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