**Introduction**: People are making recognition judgement based on memory everyday. It’s well known that people are using both long term memory (LTM) and short term memory (STM) when doing memory-retrieval tasks. However, the mechanism of the interaction between LTM and STM and if it allows certain forms of *automaticity* remained to be discovered. Regarding this, two hypothesized model were proposed -- item-familiarity model (IFM) and item-response model (IRM). Previous researchers did short-term prob-recognition memory tasks, which requires people to memorize a series of items in a short time, and then judge if a test item belongs to previous memory series or not. For these kind of tasks, IFM model explains that people use familiarity, under both LTM for the presented item in previous trials and STM for the presented item in current trial, to make judgement of the test item; IRM model explains that people learned the response label of the test item after certain trials, and then use the learned response association in LTM along with the remaining memory of memory items in current trial in STM, to make judgement of the test item. The traditional probe-recognition task conducted in previous studies showed some evidence in supporting IRM. However, studies in this kind had hard time in factoring out the different LTM familiarity for test items and memory items, since theoretically, memory items just appeared more than test items. The current study proposed a new kind of probe-recognition task to balance out the LTM familiarity for test items, so that the underlying mechanisms of item recognition can be revealed under the clearer picture.

**Experimental Design:** Stimulus will be drawn from a pool of 2,400 unique daily life pictures. In one given trial, pictures, with set size 2,4,8, will be presented on one side of the computer, either the left side or the right side. Followed by presenting memory picture on one side, the test picture, presented on the same side, will be randomly chosen to be an *old* picture drawn from memory pictures of the current trial or a *new* picture that doesn’t drawn from memory pictures of the current trial. When a test picture is a new picture on one side, it will be a memory picture on the other side. Under this design, all test items, regardless of being old or new, will have an equal chance of being presented so that they will have similar LTM familiarity.

The current design will include consistent mapping (CM) items where given item were always associated with the same old/new label; varied mapping (VM) items where given item can both be associated with old/new label; and all new (AN) items where given item is always a new item that has never appeared in previous trials if ever appears. The study will include 5 conditions correspondingly including items: pure CM, pure AN, pure VM, mixed CM and AN within trial, and mixed CM and VM within trial. Each participant experience one condition. For each condition, there will be 9 blocks with 24 trials in each block.

**Data Analysis:** Data for each participants include response time (RT); serve position (the position the old test pictures was at in memory list of that trial); and correctness for each trial. Correctness was transformed into error rate by taking one minus mean correctness for each condition. Setsize minus serve position in that trial will be taken as a measure of short term memory lag. An ANOVA, including terms setsize, condition (5 levels), and probe type (2 levels: old/new) will be used seperately for RT and error rate to test the main effect of each terms. GLEM models will be used to compare CM, VM and AN items across each condition. This model will include terms Test Item Condition (3 levels: CM/VM/AN) and Experimental Condition (2 levels: mixed/pure). The interaction between Test Item Condition and Experimental Condition will reveal if the comparison between CM/VM/AN is consistent in mixed and pure condition.

**Predicted Results**:For each condition, we predict that the lag of the test item is negatively associated with RT and error rate. That is, the lower the lag is, the stronger the memory strength of the item in STM. It is predicted that in pure CM condition, we would not see a difference in RT and error rate between old items and foils, because we assume that the same long term familiarity for them. In pure VM and pure AN condition, we would expect the same. When comparing pure CM and pure VM condition, we would expect to see a difference between CM and VM, regardless of whether the test item is old or new, which means that the participants do get advantage from item response learning. By comparing the mixed CM and VM condition, we expected to see similar results as we compare the pure CM and pure VM, but maybe with slightly smaller differences. First, if we do get results showing that there is no difference between old and new in comparison of CM and VM between or within-condition, this means the experimental design of equating the familiarity between old item and foils do works. Second, if we consist results for the comparison between CM and VM both in between condition comparison or within condition comparison (in mix condition), we will have evidence in saying that participants do use item-response learning as part of automaticity in recognition judgements.

**Future Directions**: These data can be taken to further develop the exemplar-based random-walk model (EBRW; Nosofsky & Palmeri, 1997). The current model excluded the effect of long term familaity, so it’s worth to construct a model to check if the data would fit in to an extended EBRW model. Further, if we confirmed that the IRM can explain participants item recognition in this experiment, we should go back to traditional prob test experiment to further explore how adding long-term familiarity into the picture changed participant to behave differently in mix condition (cite). It’s only after that, we can have a better confidence of explain automaticity of interaction between STM and LTM.

**Intellectual Merit:** The current study will not only bring new directions in current probe-recognition test, but also help to exclude long-term familaity in all other kinds of item-response mapping memory experiment. Further, the current study will be a stepping stone to understand the current entangled results shown in mixed condition in traditional prob-recognition test studies, which will contribute to the general picture of memory model in recognition.

**Broader Impact:** Event recognition is what people do everyday. A better understanding of how people’s event recognition ability is associated with LTM and STM will potentially contribute to many fields, such as helping people with Alzheimer’s to better recognize things around, and helping teachers to teach young children to form better event recognition ability.