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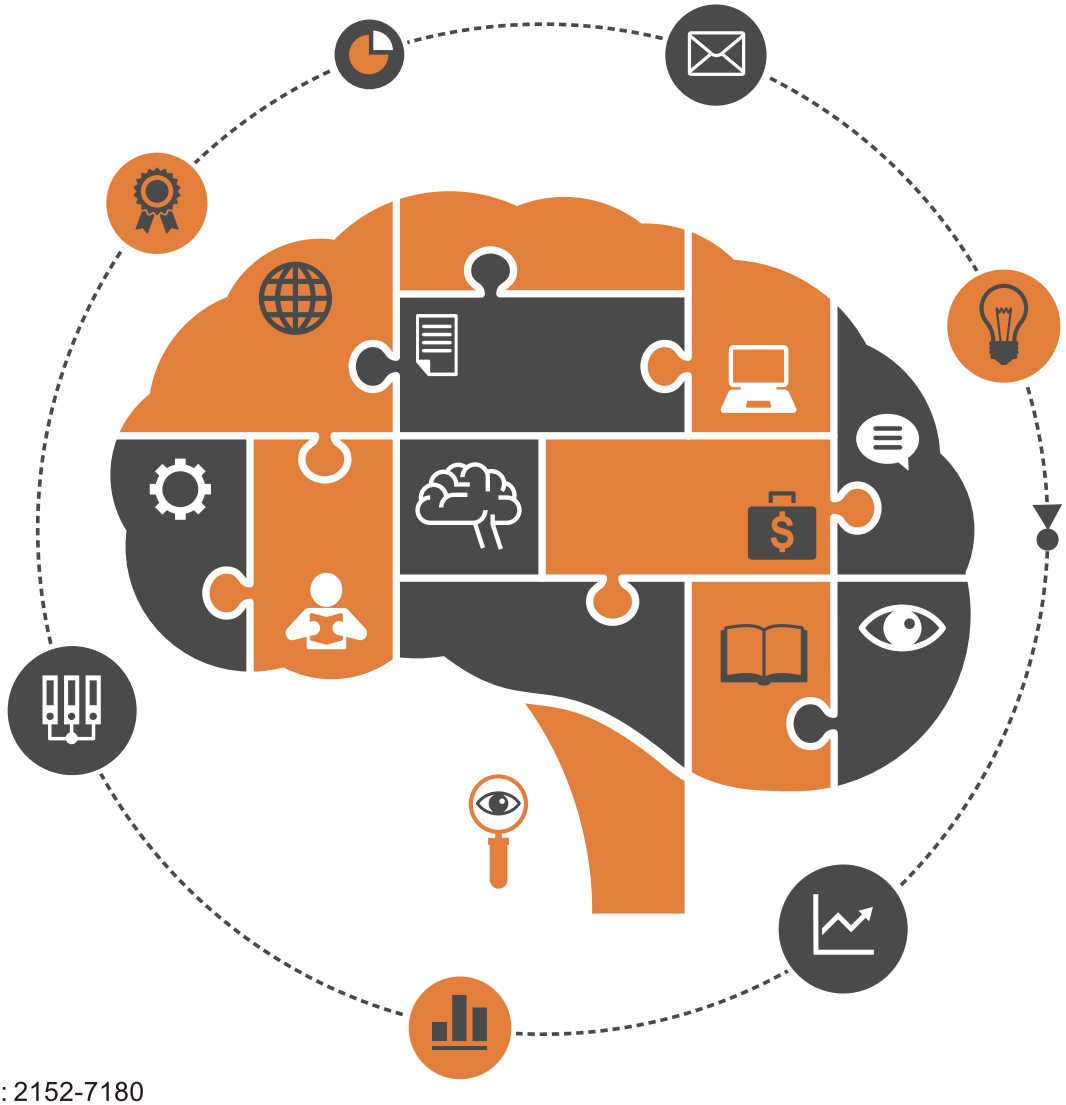

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The Role of Illness Perceptions on Health-Related Decision-Making—A Focus Group Study of Patients with Long-Term Conditions

Berit Kjærside Nielsen[1], Kirsten Lomborg[1,2]

[1]The Research Programme in Patient Involvement, Department of Clinical Medicine, Aarhus University, Aarhus, Denmark
[2]The Research Programme in Patient Involvement, Department of Public Health, Aarhus University, Aarhus, Denmark
Email: beritkn@clin.au.dk

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Abstract

Facing long-term conditions, patients often find themselves in situations where they need to make health-related decisions. The aim of this study was to gain a better understanding of patient preferences for involvement in decision-making as well as the process of decision-making both inside and outside the hospital setting. Seventeen participants with various long-term somatic conditions and different types of treatment regimens participated in this focus group study. Preference for involvement in decision-making was quantitatively measured prior to the interviews using the Control Preference Scale. To obtain the qualitative data, an interpretive description strategy was used. The Self-Regulation Model of illness perceptions was applied as a conceptual framework for discussing the findings. A number of discrepancies between questionnaire- and interview data were discovered, indicating that cognitive beliefs about personal involvement in decision-making are influenced and changed by emotions as well as a number of contextual actors, including personal values concerning everyday quality of life. This study provides insight into understanding how context influences self-regulation of health related decisions amongst patients with a number of long-term conditions. Moreover, decisions are not isolated events, they evolve over time. Thus, data on patients' desired level of involvement in decisions based on questionnaire responses alone should be interpreted with caution. Healthcare providers may benefit from exploring the patients' illness representation in the decision process and thus reduce the risk of talking at cross-purposes.

Keywords

Illness Perceptions, Decision-Making, Long-Term Conditions, Qualitative Research

1. Introduction

When people are diagnosed with a long-term condition, the need to make health-related decisions may become a central part of their everyday life. Nowadays, patients' role in health- and treatment-related decision-making has started to change in the direction of shared decision-making (Blair & Légaré, 2015). This is due to a number of reasons such as the increase of long-term conditions, unlimited access to information outside of the hospital setting, expectations for patient autonomy in medical decisions, availability of more than one treatment option, and acknowledgement of patient preferences and values (Woolf et al., 2005). Empirical research indicates that patients actively involved in treatment-related matters concerning their illness are more knowledgeable about their condition, more confident in their ability to manage their condition, and more likely to ask questions in the encounter with healthcare providers (Mosen et al., 2007; Nielsen, Mehlsen, Jensen, & Zachariae, 2013).

A recent systematic review and meta-analysis suggests that what you think about your illness matters in determining your health outcomes (Broadbent et al., 2015). Thus, a patient's perception of their illness is an important factor to consider in the process of making health-related decisions. Today, information about treatment and health plans is more available than ever in an effort to help patients increase control over their health-care experiences and health outcomes. However, experimental research has shown that emotions contribute to health-related decisions made in response to numeric medical information (Peters et al., 2009). In addition, research has also shown that people are often ignorant of their actual values and preferences when they evaluate information. Instead, people tend to construct their values and preferences immediately when asked to make a specific decision; thus at the moment of choice, people check in on their emotional state about an option and ask themselves how they feel about it. In this way, emotions guide patients' decision process (Lichtenstein & Slovic, 2006; Schwarz & Clore, 2003).

During the course of illness, patients face many decisions both inside- and outside the specific encounter with healthcare providers. Patients are part of the decision-making about medical procedures and treatments, adherence to treatment, as well as decisions regarding self-care (Thorne, Paterson, & Russell, 2003). According to the Self-Regulation Model of illness perceptions, patients engage in a continuous process of decision-making involving an integrative system of physical, cognitive, and emotional information in an effort to uphold balance (Leventhal, Diefenbach, & Leventhal, 1992). Patients thus develop representations of illness, upon which they repeatedly consider and evaluate decisions about health and health behavior. Illness representations incorporate cognitive beliefs (e.g., causes, consequences, controllability, identity, timeline) with emotional reactions to the impact of illness on everyday life and they interact through self-regulatory processes (Leventhal, Brissette, & Leventhal, 2003).

In the present study, we investigated decision-making in a broad sense beyond single-event decisions to include everyday decisions in other aspects of self-care

that may have a direct or indirect impact on the course of illness or psychological well-being. In the following, we use health-related decision-making as an overall term. As underlying psychological processes are important contributors in the course of decision-making, we applied the Self-Regulation Model of illness perceptions as a conceptual framework for discussion of findings. By doing so, we tried to gain a deeper understanding of the beliefs and emotions guiding patients when making health-related decisions.

2. Methods

The research questions in the present study focused on patients' understandings of patient involvement, including factors that may influence decision-making when living with a long-term condition. We used interpretive description to guide our study as this method facilitates the generation of knowledge applicable in healthcare with focus on information that would be important to healthcare providers (Thorne, 2016). We used purposive sampling to ensure a diverse sample, allowing recruitment of patients with different backgrounds, ages, and perspectives on involvement in various areas of treatment and care (Coyne, 1997). Focus groups were preferred over individual interviews because of its ability to make use of group dynamics to stimulate discussion, and to gain insights into the patients' shared understandings (Morgan, 1997).

2.1. Patients and Setting

In order to get as many perspectives as possible regarding the decision-making process, and to look for similarities as well as differences across diseases, patients were recruited from three different clinical departments at a large Danish university hospital. We focused on patients with one of four specific somatic conditions: Kidney disease, ulcerative colitis, breast cancer, and malignant melanoma. The department management of each clinical department approved participation. Patients were recruited on-site by trained project nurses using the following inclusion criteria: 1) age 18 years or older, 2) experiencing one of the following conditions: Kidney disease requiring dialysis, ulcerative colitis having undergone pouch surgery, breast cancer in the phase of considering secondary reconstruction, or malignant melanoma in the phase of follow-up, 3) ability to communicate in Danish, and 4) no severe cognitive impairments. In addition, project-nurses were instructed to recruit patients' representative, so far as possible, in terms of gender, age, and socio-economic status. The focus group interviews took place at a meeting room in the clinical departments. Before each interview session, patients were properly introduced and offered a small refreshment. The focus groups were moderated by the first author, while a senior researcher (the second author or her colleague) took notes.

2.2. Materials

We developed a focus group interview guide consisting of open-ended questions and discussion prompts based on a review of the research literature on patient

involvement, including health-related decision-making. During the sessions, it was ensured that all topics listed in the interview guide were covered. The moderator only intervened if necessary by probing questions and following up on topics discussed in the focus group to ensure all the participants would understand. Prior to the focus group sessions, participants filled in a questionnaire to obtain basic demographic information. Moreover, they were asked to complete the Control Preferences Scale measuring the degree of control an individual wish to take in decisions on medical treatment (Degner, Sloan, & Venkatesh, 1997). The scale is frequently used in research and the preferred decisional roles range from the patient being the primary decision maker (1: active role or 2: patient-led with physician involvement), through shared decision-making (3: collaborative role), to the patient being the passive recipient of the physician's decision (4: physician-led with patient involvement or 5: passive role).

2.3. Data Analysis

Data from the Control Preference Scale was analyzed using IBM SPSS Statistics 21. All interviews were recorded digitally and transcribed verbatim by a research assistant, and MS Word was used for management and analysis of the qualitative data. In an attempt to disclose tacit knowledge and thus expand our comprehension of the foundation on which health-related decisions are made, we sought to identify occurrences of decision-making originating in the patients themselves as well as in the interaction with their environment. In line with interpretive description, the first author read the data transcripts repeatedly to become familiar with the data, and also wrote down initial topics as well as other ideas and analytical curiosity that attracted her attention. Secondly, a reading close to the text was performed, identifying key words, sentences, and discussions between participants revolving around the research questions. During this phase, various aspects of health-related decision-making were disclosed. Both authors discussed the findings based on existing research; once findings resonated with the empirical data and the empirical data could be expressed through the analytical process, an agreement was reached on the interpretations made. Finally, we compared the responses from the questionnaire data with our findings from the qualitative data to consider whether the data complemented or contradicted each other. Discrepancy was considered constructive if it would lead to a deeper understanding of the findings (Farmer, Robinson, Elliott, & Eyles, 2006).

2.4. Ethics

The participants gave their written informed consent. According to Danish law, the present study did not need ethical approval.

3. Results

The five focus group interviews lasting between 90-120 minutes were held between December 2013 and February 2014. Participating patients were aged between 19 and 73 years (mean = 46 years), and 11 were women (**Table 1**). In

Table 1. Patient sample (n = 17).

Treatment		Inpatient dialysis	Outpatient dialysis	Pouch surgery	Secondary breast reconstruction	Follow up after melanoma
Sample		n = 3	n = 3	n = 3	n = 4	n = 4
Gender	Female	n = 3		n = 2	n = 4	n = 2
	Male		n = 3	n = 1		n = 2
Age	Mean	47.7	46.3	43	51	42.8
	range	30 - 72	22 - 73	19 - 58	41 - 57	30 - 50
Educational level	Short	n = 1	n = 1	n = 1	n = 3	n = 1
	Medium	n = 2	n = 1	n = 2	n = 1	n = 3
	High		n = 1			
Marital status	Living alone	n = 3	n = 2	n = 2	n = 1	
	Living with partner		n = 1	n = 1	n = 3	n = 4
Indication	Oncology				n = 4	n = 4
	Nephrology	n = 3	n = 3			
	Gastroenterology			n = 4		
Control preference	Active			n = 1	n = 1	
	Collaborative	n = 2*		n = 2	n = 1	n = 2
	Passive		n = 3		n = 2	n = 2

*One participant did not answer the Control Preference Scale.

three out of the five focus groups, one participant cancelled on the day of the scheduled session due to health issues, leaving only three participants in each of the three groups. In total, 17 patients participated in the focus group interviews.

3.1. Questionnaire Data

Decisional Control Preferences

An equal number of patients indicated a preference for either a collaborative role (n = 7) or a passive role with collaboration (physician-led with patient involvement, n = 7) in decision-making. A Fisher's exact test (data not shown) revealed that decisional control preference significantly differed by gender (p = 0.035) with more men preferring a passive role with collaboration. Only one patient indicated a preference for a completely active role, and one preferred an active role with collaboration (patient-led with physician involvement). None of the patients preferred a passive role with no collaboration in decision-making. One patient did not fill in the Control Preference Scale (Table 1).

3.2. Focus Group Data

For all participants across the focus groups health-related decision-making reflected a complex system of beliefs and emotions about engaging in what made sense to the patient, given his or her capability to influence a specific situation or outcome.

3.2.1. Fitting the Various Aspects of One's Illness into Everyday Life

Health-related decisions made by the patients could be regarded as having a short or long-term goal, and the appraisal of a decision was often based on quality of life in the present moment or in the long run (preventing disease progres-

sion over time). Decisions with a short-term time perspective could be choosing to eat or drink something that is not healthy when having a certain disease. Patients were often very well aware of their own decision to go against what would be medically advised, but with a lot of self-negotiating between advantages and disadvantages. Compared to the other participants, patients with kidney failure seemed to struggle more with everyday dilemmas related to decision-making on short-term quality of life rather than long-term health.

> It's so hard the thing about not being allowed to eat this and that because I don't, you know, have a bad immune system but I know it's also to prevent that it doesn't happen [get a bad immune system] and all, but I can't help it and I can't just give up all the things I used to eat. I simply can't. (Female, 30 yrs., collaborative role).

The young woman's honest statement resonated among the other two participants in the group, and it did not take them long to express solidarity.

> You sin too? (Female, 72 yrs., control preference missing)
> I do (Female, 30 yrs., collaborative role)
> I do, too (Female, 41 yrs., collaborative role)
> And I know I do (Female, 30 yrs., collaborative role)
> We all do [sin] (Female, 72 yrs., control preference missing)
> And I know very well and... (Female, 30 yrs., collaborative role)
> But we all do (Female, 72 yrs., control preference missing)
> And I really think about it and then I think ah well, probably no harm that I take one more (Female, 30 yrs., collaborative role)
> But I understand (Female, 41 yrs., collaborative role).

Considerations, that required the patient to take a long-term perspective on the consequences of a decision, were seen in relation to making a choice on how and where to treat.

> I had actually decided before but of course I listened to all they had to say because p-dialysis is by far the best choice in my situation. You know, I'm a student and it's great I don't have to be physically at the hospital three times a week. I would have to, and even though I have to do it at home to, p-dialysis is definitely the best for me so the choice was not hard (Male, 22 yrs., passive role with collaboration).

3.2.2. Facing Various Types of Decisions-When the "Right" Decision Is Not Obvious

On the subject of decision-making, it soon became clear that decisions cannot be boiled down to isolated single events during the course of long-term illness. Major decisions are based on the individual patient's ongoing thoughts and concerns, which again are influenced by the patient's health beliefs. Patients in the focus groups did not reflect openly on their decision preferences concerning health-related decision-making in everyday life. However, they were often in situations where they were made aware of the consequences of their illness,

which triggered considerations about decision-making.

> You have to adjust it [prosthesis] every time you do something, when laying on the floor doing pilates or something then it slides you know; this just reminds me about it all the time. It has not just become at natural part of me. And when I'm not wearing it then I think a lot about that people look at me there instead of looking me in the eyes and I also think that's stressful (Woman, 41 yrs., passive role with collaboration).

In situations where a decision could seem obvious from a medical point of view and in connection with specific symptoms and clinical findings, discussions in the focus groups indicated that these signs could lose their impact in the competition with possible competing illness perceptions of the patient.

> Then the hospital says that now there are no more medical options, now they recommend surgery and I was not at all ready at that point. So I thought I'll try something alternative […] And then I lost weight, so if I had not lost weight before I did then; and I thought myself it was the paleo diet that had made me skinny but I have to acknowledge as the doctors said that it probably had something to do with the disease [...] and when I looked bad I was operated, not acutely, but I was operated very fast, so... (Male, 58 yrs., collaborative role).

3.2.3. Balancing Emotions in Decision-Making

For many of the patients across the five focus groups, worries and uncertainty related to making a health-related decision were recurrent emotions. When they elaborated on their emotions, it was evident that these were present both on a short- and long-term basis. Emotions were immediately experienced while considering and deciding, but they were also tied to future life circumstances following a decision.

> I'm concerned that if it just doesn't get better, if I can still do my job and if I can't, what are my options and so on [...] Where do I go with my worries and I know you can't get a fixed schedule for this but you can hope and see but the mental feeling of insecurity connected to this for months on (Female, 52 yrs., collaborative role).

Emotions also serve as a way to shield oneself from a possible future decision. Negative emotions such as anger could in fact cover up underlying feelings of anxiety and worries associated with having to make a treatment-related decision.

> […] and my mom she kept asking about the dialysis thing, when you are going into dialysis and all, and I got mad with her because I said that, well, I don't want to discuss this because I haven't come that far yet, I don't want to discuss it at all, I don't want to talk about it now. It comes when I'm having dialysis [...] but still, well, I didn't tell them right [the health professionals], I just told my mother (Female, 30 yrs., collaborative role).

Sometimes emotions could confuse and frighten the patient to such an extent

that there would be doubts about the right treatment. The women, who had a breast removed because of cancer, were all offered adjuvant therapy, and in the process of deciding as well as after the decision had been made, strong emotions could lead to decisional conflict.

> But then I start thinking about how does it help because when you lose your hair, lose your eye brows and you lose it all and you stand there looking at yourself in the mirror. You also miss a breast, you are so naked and you are so vulnerable eh, and then you think to yourself, honestly, is it worth it (Female, 49 yrs., collaborative role).

3.2.4. The Role of Healthcare Providers

Generally, patients showed a clear interest in being involved in health-related decision-making if they received adequate information. Receiving adequate information also included the doctor's ability to tailor the information to match the patient and to feel that personal values and preferences were actually being taken into account.

> And he was very personal about it [the doctor] and said something about that he was older than me, when he was very young, if there was anybody who had offered him a ostomy then he would absolutely go on with a pouch, he had no doubts about that, but now when he was at this age and had the experience, if he was offered it today he would settle for the ostomy. So he had already gotten me started thinking, you know (Male, 58 yrs., collaborative role).

Managing illness on a daily basis would require the patients to make, sometimes difficult, decisions about choosing to live with a number of restrictions to prevent progression of symptoms. More women than men emphasized the need to receive guidance and emotional support from health providers concerning this. If those needs were not met, it could lead to patients almost giving up.

> The last time she said [the dietician] why do you come here? because you know what to do and what not to do. So I say yes, I know but I just want to talk to someone. I know, but I just can't, really I can't [follow her diet] (Female, 30 yrs., collaborative role).

3.3. Synthesis of Data

When we compared responses from the questionnaire with qualitative statements from the participants, several instances of dissonance occurred. It became clear that more patients expressed a more passive role in the interviews than the preferred role they had indicated in the Control Preference Scale. In the focus group consisting of women who were in the process of considering secondary breast reconstruction, this decision was associated with major ambivalence. So far, for most of the women, there had been no doubt about their breast cancer treatment, and there was a general agreement that there is a significant difference between having to make a decision regarding "necessary" treatment (cura-

tive treatment) and additional treatment, which initially was perceived by the women as a cosmetic intervention.

> Well, it's here [department of plastic surgery] where it's been really difficult because you had to decide what should be done. Sometimes I said to the doctor oh can't you just say what should be done to get the best result, so I don't need to take any responsibility at all myself. Eh then I thought it was difficult eh, and I still find it difficult if what I have chosen is the right thing (Woman, 49 yrs., collaborative role).

However, there were also examples of agreement between the questionnaire responses and interview statements. A woman who was treated surgically for breast cancer was presented with the possibility of adjuvant therapy. She thought that doctors saw her as a demanding patient, when she questioned their manual-like clinical guidelines for treating her breast cancer.

> I didn't fit in. No, I didn't just say yes. I said, well I don't know if I want to and I want to know more if it makes a different at all and it's a microscopic difference it makes compared to how uncomfortable it is. And then I still would say that if it wasn't for my family pushing me, then I wouldn't have done it (Female, 57 yrs., active with collaboration).

4. Discussion

In the present study we investigated strategies used by patients with long-term conditions when making health-related decisions. In our analysis, it became clear that the very notion of decision preference is challenging. Patients view their circumstances differently and our study indicates that there are many significant and interrelated issues concerning health-related decisions. We found that patients' cognitive beliefs about their preferred level of involvement are shaped by a number of contextual actors, such as the type of decision to be made, trust in your healthcare provider, and personal values concerning everyday quality of life. During the process of interpreting data, we applied the Self-Regulation Model of illness perception with the aim of raising our findings above the specific setting that guided our research question. By considering the continuous cognitive and emotional appraisals made by the patient in health-related decision-making, healthcare providers may benefit from exploring the patients' illness representation in the decision process and thus reduce the risk of talking cross-purposes. Doctors can provide accurate diagnoses and offer excellent treatments, but if the treatment does not match the patients' view of illness, they are more likely to seek other means (Petrie & Weinman, 2012). Attending to the patient's emotions requires flexibility and empathy, rather than standardized questions about values. Moreover, studies in decision-making indicate that emotions not only reflect but also influence patient values (Lichtenstein & Slovic, 2006). Therefore, healthcare providers need to disclose patients' emotional appraisals regularly to clarify the underlying values. It is problematic to assume that peoples' life values can be easily categorized and defined in advance. Ex-

amining the various and interrelated actors present in the process of decision-making is thus an important knowledge gap that future research should consider.

Throughout the decision-making process, patients' continuously have to check in on their emotions to make sure that they are guided instead of misled by their emotions. Earlier, the assumption among researchers in decision-making was that when people made a decision that was inconsistent with the evidence presented to them, it had to be due to cognitive limitations (Leventhal et al., 2003). However, as described in the Self-Regulation Model of illness perceptions, thinking and feeling do not always guide people in the same direction. Recent research has shown that subtle contextual factors may trigger strong emotions, such as fear, which may evoke an avoidance reaction (Ubel, 2010). These findings may also explain the discrepancy between our participants' preferred level of involvement in decision-making measured by the Control Preference Scale and their statements in the subsequent focus group interview. In several of the patients it turned out that there was discrepancy between their cognitive appraisal with regard to being involved in decision-making on the one hand and their preferred level of involvement in the present moment, when a decision was made. These findings are in line with a recent study by Massey et al. (2015), who investigated the extent to which goal cognitions, illness perceptions, and treatment beliefs were related to changes in self-reported medication adherence after transplantation. The authors found a discrepancy between beliefs about adherence and actual behavior (Massey et al., 2015). When analyzing the questionnaire data isolated from the qualitative data, we found that statistically more men than women had a preference for the doctor to make the final decisions about treatment while listening to the patient's concerns (passive role with collaboration). This is consistent with previous research, suggesting that men are less likely to desire participation or to seek a second opinion (Henrikson, Davison, & Berry, 2011). Returning to the complete data, we noticed that the inconsistency between questionnaire response and interview statements was more prevalent among the female participants, indicating that women are more likely to be guided by emotions than men when making a decision. On the other hand, one of the focus groups consisted of women who were in the process of considering secondary reconstruction after breast cancer, and for all these women, there was a lot of uncertainty related to this decision. Uncertainty can also be perceived as decisional conflict, and is defined as an intrapersonal psychological construct experienced when facing decisions that involve risk, loss, regret or challenges concerning life values (Thompson-Leduc, Turcotte, Labrecque, & Legare, 2016). When the women discussed their curative treatment for breast cancer, the experience of uncertainty was considerably less, suggesting that the type of decision might also explain the gender differences found in our study.

If for a moment, we were to ignore the Self-Regulation Model of illness perception as a potential explanation of the inconsistency between questionnaire responses and interview statements, we could instead question, whether health-

related initiatives perceived by researchers and healthcare providers to be suitable for patient involvement, is not considered as such from the patient's perspective. We found several examples in our interview data that point in this direction. In particular, our focus group participants did often not fully appraise matters of treatment as an area of patient involvement. Our findings may therefore help expand the understanding of patient involvement in decision-making perceived by the patient. The preference for a collaborative role by the majority of the participants in our study suggests that patients indeed have a need to understand their illness and the choices available to them. It may also suggest a need to be involved to some degree in certain aspects of decision-making, such as decisions affecting everyday quality of life. Nonetheless, it is not guaranteed that every patient want nor understand involvement in decision-making as to take charge along with the doctor when it comes to choosing one treatment over another. The empirical evidence shows that patients are in fact willing to leave much of the responsibility for decisions that require specific expertise to the healthcare provider (Deber, Kraetschmer, Urowitz, & Sharpe, 2007). The need to consider patients' decisional role preferences appears to be an intrinsic good that cannot be legitimately opposed in the professional care discourse (Boivin, Green, van der Meulen, Legare, & Nolte, 2009). Our findings may disclose a way to approach patient preferences moving beyond pre-existing assumptions. We must be careful how we interpret patients' desired level of involvement in decisions based on questionnaire responses, and future research must pursue this further to make sure, that clinical changes are made based on the best possible knowledge.

The present study has several limitations. First, as the foundation of qualitative research is to gain in-depth insight into a phenomenon perceived by individuals, the generalizability of the findings in our study is challenging. Only 17 patients participated in the present study, but according to Thorne, patients theoretically represent infinite variation in relation to their experiences with health care, and thus data saturation was not a desired outcome (Thorne, 2016). Another way to determine whether the sample size is sufficient is to apply the concept of information power, proposed by Malterud and colleagues (2015). In their article, they argue that the larger information power the sample holds, the lower N is needed, and this is determined by items such as study aim, sample specificity, use of established theory, quality of dialogue, and analysis strategy (Malterud, Siersma, & Guassora, 2015). By critically evaluating these items with regard to the methodology applied in our study, we believe that we were able to get sufficient variation of results despite the low number of patients participating. Secondly, we collected information about the participants' preferred role in decision-making retrospectively, which may have given rise to recall bias. Although patients were asked to discuss their need to be more or less involved, and to describe specific situations that required a decision to be made, we did not observe these situations. Finally, we asked the participants to complete the Control Preference Scale prior to the focus group interview with the aim of investi-

gating discrepancies between questionnaire- and interview data. What could have strengthened our study was to subsequently introduce the participants to our findings. This could have contributed to a greater understanding of how to interpret the apparent discrepancy.

5. Conclusion

This study provides insight into understanding how context influences self-regulation of health related decisions amongst patients with a number of long-term conditions. The results showed that patients' perceptions of themselves and their preferences were often different whether they were reported in questionnaires or in focus group interviews. The study indicates that patients express more eagerness to take part in decisions when considerations about decision-making are isolated from the contextual conditions related to real-life.

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Neuropsychological Performance of Egyptian Children with Autism Spectrum Disorder and Attention Deficit Hyperactivity Disorder

Sherin Elsheikh[1,2,3], Sanna Kuusikko-Gauffin[1], Soile Loukusa[4], Manal Omar[5], Geylan Riad[6], Hanna Ebeling[1,7], Irma Moilanen[1,7]

[1]PEDEGO Research Unit, Child Psychiatry, University of Oulu, Oulu, Finland
[2]Child Psychiatry Unit, Abbassia Mental Hospital, Cairo, Egypt
[3]Centre for Arctic Medicine, Thule Institute, University of Oulu, Oulu, Finland
[4]Research Unit of Logopedics, Child Language Research Center, University of Oulu, Oulu, Finland
[5]Institute of Postgraduate Childhood Studies, Ain Shams University, Cairo, Egypt
[6]Faculty of Arts, Psychology Department, Helwan University, Cairo, Egypt
[7]Clinic of Child Psychiatry, Oulu University Hospital, Oulu, Finland
Email: sherinelsheikh@gmail.com

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Abstract

This study examined the neuropsychological functioning in autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and comorbid ASD and ADHD (ASD + ADHD), using five domains of the Developmental Neuropsychological Assessment (NEPSY): Attention and Executive Functions, Language, Visuospatial Processing, Sensorimotor Functions, and Memory and Learning. The participants were 6- to 12- year-old Egyptian children with ASD (n = 17), ASD + ADHD (n = 15), ADHD (n = 37), and typical development (TD; n = 29). TD children scored highest on the NEPSY domains, then children with ADHD, followed by children with ASD and ASD + ADHD. Children with ASD or ASD + ADHD performed significantly poorer than TD children on all NEPSY domains. Children with ADHD exhibited significantly poorer performance than TD children on NEPSY domains of Attention and Executive Function, Language, and Memory and Learning. Also, both ASD and ASD + ADHD groups scored significantly lower than ADHD group on all other NEPSY domains except Visuospatial Processing. There were no significant differences between ASD and ASD + ADHD groups on NEPSY. Compared to TD children, our results suggest that ADHD symptoms in children with ASD may worsen the ability to plan, hand motor coordination, and memorizing names. Nevertheless, the presence of ADHD symptoms may mitigate the difficulties that children with ASD exhibit in other neuropsychological areas, such as verbal fluency, hand praxis, finger gnosis,

and face memory.

Keywords

ASD, ADHD, NEPSY, Cognitive Development, Neuropsychological Performance, Executive Function, Comorbidity, Children

1. Introduction

Deficits in neuropsychological abilities have been described in both autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD). The diagnostic criteria for ASD and ADHD are distinct; children with ASD are characterized by impaired social and communication skills and by restricted repetitive stereotyped pattern of behavior, whereas children with ADHD mainly present symptoms of inattention, hyperactivity and impulsivity (APA, 2013; WHO, 1993). However, it is not uncommon to have overlapping symptoms of ADHD and ASD in one child, such as deficits in attention, behavioral problems and social difficulties and several studies demonstrated that about 20% - 50% of children with ADHD meet the diagnostic criteria for ASD and about 30% - 80% of children with ASD meet the diagnostic criteria for ADHD (Mattila et al., 2010; Rommelse, Franke, Geurts, Hartman, & Buitelaar, 2010). There have been debates, over the last decade about overlapping symptoms and comorbidity of ASD and ADHD (Ames & White, 2011; Gargaro, Rinehart, Bradshaw, Tonge, & Sheppard, 2011; Reiersen & Todd, 2008; Ronald, Simonoff, Kuntsi, Asherson, & Plomin, 2008; Taurines et al., 2012), leading to acceptance of dual diagnosis of ASD and ADHD in DSM-5 (APA, 2013).

There are no published studies comparing different domains of the neuropsychological profile (attention and executive function, language, visuospatial abilities, sensorimotor abilities, and memory and learning domains) in children with ASD, ADHD and comorbid ASD and ADHD (ASD + ADHD). Previous studies, which have evaluated these domains, separately included children with ASD (Barron-Linnankoski et al., 2015; Hooper, Poon, Marcus, & Fine, 2006; Narzisi, Muratori, Calderoni, Fabbro, & Urgesi, 2013; Williams, Goldstein, & Minshew, 2006a) or ADHD (Rizzutti et al., 2008; Rucklidge & Tannock, 2002). Further, studies that investigated the differences of neuropsychological functioning between children with ASD and ADHD, only analyzed some selected neuropsychological abilities, such as sustained attention (Johnson et al., 2007), inhibitory control (Bühler, Bachmann, Goyert, Heinzel-Gutenbrunner, & Kamp-Becker, 2011), or executive function (Geurts, Verte, Oosterlaan, Roeyers, & Sergeant, 2004; Goldberg et al., 2005; Happé, Booth, Charlton, & Hughes, 2006; Matsuura et al., 2014). In these studies, children with ADHD demonstrated deficits in sustained attention and response inhibition, compared to children with ASD (Johnson et al., 2007; Buhler et al., 2011). Results of studies examining response inhibition, planning and cognitive flexibility (i.e., shifting attention) in

ASD are not, however, consistent (Geurts et al., 2004; Goldberg et al., 2005; Happé et al., 2006; Johnson et al., 2007; Van der Meer et al., 2012). Similarly, studies evaluating the influence of comorbidity in ASD + ADHD diagnoses focused on individual abilities, such as attention (Sinzig, Bruning, Morsch, & Lehmkuhl, 2008a), inhibitory control (Takeuchi et al., 2013), or executive function (Sinzig, Morsch, Bruning, Schmidt, & Lehmkuhl , 2008b; Yerys, et al., 2009; Tye et al., 2014) but not the wider neuropsychological profile. Sinzig and colleagues (2008b) found that children with ASD + ADHD showed deficit in inhibiting a pre-potent response and inhibition of an ongoing response in addition to deficits in planning and flexibility, but there were no indication that children with ASD + ADHD would have a specific attention profile, when compared to pure ASD (Sinzig et al., 2008a). Tye and colleagues (2014) suggested that children with ASD + ADHD presented an additive combination of deficits of both disorders. It is also noteworthy to mention that majority of neuropsychological studies on individuals with ASD, ADHD, and ASD + ADHD were conducted in the Western World with no data originating from the Middle East.

With the above-mentioned gaps in literature in mind, we established a prospective comparative study to examine the similarities and differences of the neuropsychological performance between Egyptian children with ASD, ASD + ADHD, ADHD and TD, using a single multi-domain neuropsychological battery (the NEPSY, Korkman, 2000).

2. Method

2.1. Participants and Procedure

A total of sixty-nine Arabic speaking Egyptian children with ASD (n = 17), ASD + ADHD (n = 15), and ADHD (n = 37) participated in the study with their TD counterparts (n = 29). **Table 1** details the demographic information of the participants. The diagnostic groups were recruited through the child psychiatry outpatient clinic of the Abbassia Mental Hospital-a tertiary referral public hospital (ASD, n = 6; ASD + ADHD, n = 7; ADHD, n = 16), and a private child psychiatry clinic in Cairo (ASD, n = 11; ASD + ADHD, n = 8; ADHD, n = 21), over two years (2007 and 2008). The TD children were randomly selected from public (n = 12) and private (n = 17) mainstream schools in Cairo. Children were recruited from public and private sectors, so that the study groups would be representative of different socioeconomic statuses.

Psychiatric diagnoses were set according to International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) (WHO, 1993) and confirmed with Autism Diagnostic Interview (ADI-R; Lord, Rutter, & Le Couteur, 1995) and Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, Dilavore, & Risi, 2000). The Schedule for Affective Disorders and Schizophrenia for School-Age Children/Present and Lifetime Version (K-SADS-PL; Kaufman et al. 1997; based on the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, DSM-IV (APA, 2013) was used to confirm the diagnosis of ADHD. Severe developmental disorders (e.g., specific language impairment,

Table 1. Demographic and psychometric data of study participants.

	ASD (n = 17)	ASD+ADHD (n =15)	ADHD (n = 37)	TD (n = 29)	
Gender (boys/girls)	16/1	13/2	29/8	20/9	
Autism diagnosis					
AS	7	10	0	0	
HFA	10	5	0	0	
ADHD subtype					
Combined	0	2	21	0	
Inattentive	0	2	11	0	
Hyperactive	0	11	5	0	
Age					
Range	6 - 12	6 - 12	6 - 12	6 - 12	
Mean, SD	7.35 (2.09)	7.87 (1.55)	9.19 (1.68)	9.14 (1.94)	ASD < ADHD** ASD < TD*
FSIQ (mean, SD)	94.41 (21.19)	99.93 (17.34)	111.11 (17.72)	124.90 (11.11)	ASD < ADHD** ASD < TD*** ASD + ADHD < TD*** ADHD < TD**
VIQ (mean, SD)	97.82 (22.93)	104.60 (17.02)	120.89 (17.51)	135.00 (10.64)	ASD < ADHD*** ASD < TD*** ASD + ADHD < ADHD* ASD + ADHD < TD*** ADHD < TD**
PIQ (mean, SD)	92.00 (17.44)	94.73 (16.85)	98.14 (17.69)	109.00 (12.59)	ASD < TD** ASD + ADHD < TD* ADHD < TD*

One-way analysis of variance (ANOVA) with Post hoc group comparisons for age and IQ differences, *p < 0.05, **p < 0.01, ***p < 0.001. ASD = autism spectrum disorder; ASD + ADHD = comorbid ASD and ADHD; ADHD = attention deficit hyperactivity disorder; TD = typically developing children; AS = Asperger Syndrome; HFA = high functioning autism; FSIQ = Full scale IQ; VIQ = Verbal IQ; PIQ = Performance IQ.

epilepsy, and fragile-X), a full scale of IQ (FSIQ) lower than 70 measured with the Arabic version of Wechsler Intelligence Scale for Children-Third Revision (WISC-III; Kamel & Ismail, 1999; Wechsler, 1991), and ADHD medication (i.e., psychostimulants and Atomoxetine) were used as exclusion criteria. However, one child, who started Atomoxetine therapy one week prior to the assessment was included in the study, as there is a four- to six-week window period before the therapeutic effect of this medication starts (Taylor, Paton, & Shitij, 2012).

The study was approved by the ethical committee of the Rights of Human Subjects in Scientific Research in General Secretariat of Mental Health in Cairo, Egypt. The procedure was fully explained to the participants' parents and informed consents were obtained from all parents before study enrolment.

2.2. Measures

A developmental neuropsychological assessment NEPSY for 3- to 12-year-old children was employed to investigate the neurocognitive development in five neuropsychological domains (i.e., Attention and Executive Functions, Language, Sensorimotor Functions, Visuospatial Processing, and Memory and Learning)

and each domain comprises of several subtests (Korkman, Kirk, & Kemp, 1997; Korkman, Kirk, & Kemp, 1998). We addressed the first edition of NEPSY, as NEPSY-II was not available during the time of data collection. The NEPSY is adapted and standardized from its original Finnish version (Korkman et al., 1997) into a United States (US) version (Korkman, et al., 1998). The original Finnish NEPSY subtests of Object Recognition, Object Memory, and Comprehension of Sentence Structure do not exist in US NEPSY version. The psychometric properties of NEPSY are satisfactory (Korkman, 2000). All NEPSY subtests have verbal instructions and most of them include initial practice trials to reduce the novelty effect and to ensure that the participant understands the task.

For the purpose of this study, the authors translated the US version of NEPSY into Arabic. In addition, the NEPSY subtest of Comprehension of Sentence Structure was translated from the Finnish version of NEPSY into Arabic. A process of repeated translation and back-translation took place until the congruent Arabic version was achieved. Arabic versions of Comprehension of Sentence Structure, Comprehension of Instruction, and Sentence Repetition subtests have the same content and nearly the same number of words as the original US/Finnish versions. In Narrative Memory subtest, we made certain that the Arabic version of the story has the same sequence of events, same number of sentences, and same total number of words as the US NEPSY version. Appropriate Arabic list of words has been chosen carefully for Phonological Processing subtest to allow omitting and substituting syllables producing new real words. Arabic tongue twisters have been used for Oromotor Sequences subtest. Regarding the selecting of suitable Arabic letters for the phonemic part of Verbal Fluency subtest, letters S (*seen*) and F (*faa*) were found to be appropriate regarding the frequency of the words that start with these letters and because these letters are not commonly attached to the words as prefixes. List Learning and Memory subtest was also translated into Arabic. Eight Arabic names were elected for Memory of Names subtest. In order to implement Auditory Attention and Response Set subtest, a new audiotape was recorded in Arabic language, on which words and colors are recorded in the same order and at the same speed as on the English audiotape. In repetition of Nonsense Words subtest, the original US NEPSY audio recording was used.

Full neuropsychological assessment using the NEPSY was undertaken with all participants, by the same examiner in a quiet room during two sessions, each lasting 1 - 1.5 hours. Short descriptions of the employed NEPSY subtests in each domain are listed below:

Attention and Executive Functions includes six subtests (Tower, Auditory Attention and Response Set, Visual Attention, Statue, Design Fluency, and Knock and Tap), that which measure the ability to shift and maintain selective attention, motor persistence and inhibition, non-verbal fluency and self-regulation.

Language domain includes seven subtests (Phonological Processing, Speeded Naming, Comprehension of Instructions, Repetition of Nonsense Words, Verbal Fluency, Oromotor Sequences, and Comprehension of Sentence Structure), that evaluate phonemic awareness, the ability of producing and recalling words ra-

pidly, ability to understand and respond quickly to verbal instructions, ability to understand grammar, ability to encode and decode by repeating a pattern of nonsense words, ability to produce words and oromotor coordination.

Visuospatial Processing includes five subtests (Design Copying, Arrows, Block Construction, Route Finding, and Visual Recognition), that measure the ability to copy two dimensional shapes, visuomotor integration, line orientation, the ability to make three-dimensional constructions, the visual-spatial relation and directionality, visual recognition and perception.

Sensorimotor Functions includes five subtests (Fingertip Tapping, Imitating Hand Positions, Visuomotor Precision, Manual Motor Sequences, and Finger Discrimination), that assess the ability to finger dexterity, ideomotor praxity, visuomotor coordination, manual motor coordination, and ability to identify fingers using tactile information without the aid of vision.

Memory and Learning includes six subtests (Memory for Faces, Memory for Names, Narrative Memory, Sentence Repetition, List Learning, and Visual Memory), to assess the visual short-term memory, visuoverbal association memory, auditory working memory, and verbal learning.

2.3. Statistical Analysis

The statistical analyses were carried out using the IBM SPSS statistical software program, version 22.0. Since there are no available standardized scores for Arabic speaking children, we utilized the NEPSY total raw scores controlling for age, instead of age normed standard scores. Higher raw scores indicate better performance in all NEPSY subtests except for Fingertip Tapping subtest, in which the total score is the time taken to accomplish the task with a maximum total time of 300 seconds. In order to facilitate the comparisons between NEPSY subtests, participants' raw scores in Fingertip Tapping subtest were subtracted from the maximum score of 300 so that the higher score would indicate better performance also on that subtest. Furthermore, to examine the differences between groups on the five NEPSY domains (Attention and Executive Function, Language, Visuospatial Processing, Sensorimotor Function, and Memory and Learning) and assuming that the subtests included in each NEPSY domain are assessing the same neuropsychological function (Korkman et al., 1998), we formed a new set of Domain Scores by summing the raw scores of the subtests included in each domain (e.g. Domain Score of Attention and Executive Function is the sum of the raw scores of Tower, Auditory Attention and Response Set, Visual Attention, Statue, Design Fluency, and Knock & Tap subtests).

There were significant age and IQ differences between the groups (**Table 1**). The relatively small sample size restrained us from using multiple covariates, thus we chose to control for age in our further analysis. To examine the differences in mean scores in NEPSY Domain Scores and NEPSY subtests' raw scores, we conducted multivariate analyses of covariance (MANCOVA) test with the groups (i.e. ASD, ADHD, ASD + ADHD, and TD groups) as a fixed factor and either NEPSY Domain scores or NEPSY raw scores as dependent variables, controlling for age (**Table 2**). We found a significant main effect of group (F (15,

Table 2. Means and standard errors of raw scores for NEPSY domains and subtests by MANCOVA controlling for age.

	ASD M (SE)	ASD+ADHD M (SE)	ADHD M (SE)	TD M (SE)
Attention and Executive Functions	64.59 (15.03)	69.13 (19.35)	147.46 (8.00)	177.35 (6.24)
Tower	11.09 (0.84)	11.21 (0.87)	14.00 (0.56)	15.17 (0.62)
Auditory Attention & Response Set0	13.14 (8.44)	9.79 (8.72)	54.23 (5.65)	70.62 (6.24)
-Auditory Attention	13.86 (4.60)	12.76 (4.75)	35.24 (3.08)	40.68 (3.40)
-Response Set	0.71 (4.54)	2.99 (4.69)	18.99 (3.03)	29.94 (3.35)
Visual Attention	7.28 (1.29)	8.80 (1.33)	11.99 (0.86)	14.73 (0.95)
Statue	13.94 (1.61)	16.92 (1.66)	22.83 (1.07)	23.72 (1.19)
Design Fluency	10.80 (1.63)	10.34 (1.68)	17.76 (1.09)	20.71 (1.20)
Knock & Tap	20.26 (1.47)	19.31 (1.51)	25.35 (0.98)	27.99 (1.08)
-Knock & Tap-part 1	11.66 (0.68)	10.75 (0.70)	13.03 (0.45)	14.31 (0.50)
-Knock & Tap-part 2	8.60 (0.91)	8.56 (0.94)	12.32 (0.60)	13.68 (0.67)
Language	117.35 (13.52)	137.33 (10.91)	185.97 (7.51)	217.45 (6.95)
Phonological Processing	20.17 (1.65)	20.67 (1.71)	25.60 (1.10)	28.89 (1.22)
Speeded Naming	11.12 (2.79)	11.16 (2.89)	20.11 (1.87)	28.93 (2.07)
Comprehension of Instructions	15.70 (0.79)	17.36 (0.81)	20.50 (0.52)	23.42 (0.58)
Repetition of Nonsense Words	14.14 (2.21)	16.61 (2.28)	18.87 (1.47)	20.20 (1.63)
Verbal Fluency	19.19 (2.69)	25.44 (2.78)	33.88 (1.80)	38.38 (1.99)
Verbal Fluency-Semantic	14.82 (2.11)	18.67 (2.17)	26.78 (1.40)	29.67 (1.55)
Verbal Fluency-Phonemic	4.24 (0.95)	6.68 (0.98)	7.16 (0.63)	9.09 (0.70)
Oromotor Sequences	37.83 (2.79)	40.80 (2.88)	46.72 (1.86)	55.15 (2.06)
Comprehension of Sentence Structure	13.53 (0.64)	13.98 (0.66)	16.15 (0.43)	17.19 (0.47)
Visuospatial Processing	81.06 (5.67)	76.53 (6.15)	101.68 (4.06)	111.38 (3.35)
Design Copying	43.30 (2.80)	40.24 (2.90)	49.16 (1.87)	51.76 (2.07)
Arrows	14.06 (1.36)	14.21 (1.41)	17.51 (0.91)	21.55 (1.01)
Block Construction	9.64 (0.69)	8.78 (0.72)	10.49 (0.46)	11.93 (0.51)
Route Finding	5.06 (0.62)	4.59 (0.64)	5.80 (0.42)	6.34 (0.46)
Visual Recognition	16.42 (1.18)	13.24 (1.22)	16.26 (0.79)	17.05 (0.87)
Sensorimotor Functions	261.82 (21.11)	262.67 (27.84)	343.11 (8.17)	368.41 (5.12)
Fingertip tapping	176.81 (11.78)	175.70 (12.17)	222.915 (7.88)	235.19 (8.71)
Imitating Hand Positions	16.58 (1.06)	16.33 (1.09)	20.71 (0.71)	21.15 (0.78)
Imitating Hand Positions-Preferred Hand	8.40 (0.54)	8.24 (0.56)	10.40 (0.36)	10.74 (0.40)
Imitating Hand Positions-Non-preferred Hand	8.17 (0.58)	8.09 (0.60)	10.30 (0.38)	10.40 (0.43)
Visuomotor Precision	12.03 (1.88)	12.89 (1.95)	20.23 (1.26)	24.22 (1.39)
Manual Motor Sequences	41.97 (2.60)	36.61 (2.68)	45.99 (1.74)	51.64 (1.92)
Finger Discrimination-Preferred Hand	12.46 (0.86)	13.58 (0.89)	15.16 (0.57)	16.55 (0.63)
Finger Discrimination-Non-preferred Hand	12.13 (0.90)	13.70 (0.93)	15.21 (0.60)	15.91 (0.66)

Continued

Memory and Learning	98.06 (7.48)	106.13 (8.64)	150.70 (5.55)	170.66 (4.65)
Memory for Faces	19.48 (1.14)	22.35 (1.18)	26.65 (0.76)	26.99 (0.84)
Immediate Memory for Faces	9.38 (0.58)	11.62 (0.60)	13.21 (0.39)	13.67 (0.43)
Delayed Memory for Faces	10.06 (0.72)	10.71 (0.75)	13.17 (0.48)	13.33 (0.53)
Memory for Names	21.91 (1.61)	16.21 (1.67)	20.77 (1.08)	23.29 (1.19)
Immediate Memory for Names	15.86 (1.19)	11.90 (1.23)	15.11 (0.79)	16.77 (0.88)
Delayed Memory for Names	6.21 (0.59)	4.96 (0.61)	5.65 (0.40)	6.52 (0.44)
Narrative Memory	9.40 (1.68)	13.11 (1.74)	24.86 (1.12)	27.56 (1.24)
Narrative Memory-Free Recall	7.07 (1.97)	9.87 (2.04)	21.05 (1.32)	24.60 (1.46)
Narrative Memory-Cued Recall	2.32 (0.66)	3.23 (0.68)	3.80 (0.44)	2.95 (0.49)
Sentence Repetition	12.64 (1.24)	16.01 (1.28)	19.94 (0.83)	24.06 (0.91)
List Learning	35.80 (3.44)	34.82 (3.56)	46.40 (2.30)	55.94 (2.54)
Immediate List Memory	30.96 (2.90)	29.04 (2.99)	36.71 (1.94)	44.97 (2.14)
Delayed List Memory	6.25 (1.29)	5.99 (1.33)	9.53 (0.86)	10.84 (0.95)
Visual Memory	8.01 (0.55)	9.19 (0.57)	8.92 (0.37)	9.43 (0.41)

Higher scores reflect better performance. ASD = autism spectrum disorder; ASD + ADHD = comorbid ASD and ADHD; ADHD = attention deficit hyperactivity disorder; TD = typically developing children.

246) = 4.76, $p < .001$, Wilks' Lambda = .495, $\eta_p^2 = .209$) and age ($F(5, 89) = 6.09$, $p < .001$, Wilks' Lambda = .745, $\eta_p^2 = .255$) on NEPSY Domain scores. Further we also found a significant main effect of group ($F(129, 153) = 2.24$, $p < .001$, Wilks' Lambda = .042, $\eta_p^2 = .652$) and age ($F(43, 51) = 2.57$, $p < .01$, Wilks' Lambda = .315, $\eta_p^2 = .685$) in NEPSY raw scores.

In the follow-up between the group analyses we focused on six contrasts controlling for age. First, we compared each diagnostic group with the TD group. Second, we compared the diagnostic groups with each other. Effect size was evaluated by using the Eta-squared (η_p^2) statistic. A significant threshold of ≤ 0.001 was set for NEPSY subtests' raw scores and of ≤ 0.01 for NEPSY Domain Scores to control false discoveries in multiple comparisons.

3. Results

Between-group comparisons revealed that TD children scored highest on all NEPSY domains, followed by children with ADHD, then children with ASD + ADHD and ASD. Children with ADHD showed significantly poorer performance than TD children on NEPSY domains of Attention and Executive Function, Language, and Memory. Also, both ASD and ASD + ADHD groups scored significantly lower than ADHD group on all NEPSY domains aside from Visuospatial Processing. Table 2 & Table 3 compares the means of NEPSY domains and neuropsychological performance in TD children, children with ADHD, children with ASD + ADHD and ASD, respectively.

ASD group compared with TD group. ASD group performed significantly

Table 3. Neuropsychological performance on NEPSY by MANCOVA controlling for age

	Comparison with TD group									Comparison between diagnostic groups								
	ASD vs. TD			ASD + ADHD vs. TD			ADHD vs. TD			ASD vs. ADHD			ASD vs. ASD + ADHD			ADHD vs. ASD + ADHD		
	F	*p* value	η_p^2	*F*	*p* value	η_p^2	*F*	*p* value	η_p^2	*F*	*p* value	η_p^2	*F*	*p* value	η_p^2	*F*	*p* value	η_p^2
Attention and Executive Functions	46.09	**≤.001**	.517	34.41	**≤.001**	.456	9.42	**≤.01**	,132	19.88	**≤.001**	.284	.001	.975	.000	16.83	**≤.001**	.260
Tower	12.06	**≤.001**	.219	17.92	**≤.001**	.304	3.42	.069	.052	5.01	.030	.091	.009	.927	.000	7.30	.009	.132
Auditory Attention & Response Set	31.61	**≤.001**	.424	26.71	**≤.001**	.395	7.57	.008	.109	15.18	**≤.001**	.233	.037	.848	.001	15.08	**≤.001**	.239
-Auditory Attention	21.95	**≤.001**	.338	21.27	**≤.001**	.342	2.29	.135	.036	12.64	**≤.001**	.202	.008	.928	.000	13.38	**.001**	.218
-Response Set	28.29	**≤.001**	.397	26.76	**≤.001**	.395	13.21	**≤.001**	.176	12.05	**≤.001**	.194	.071	7.92	.002	13.51	**.001**	.220
Visual Attention	21.56	**≤.001**	.334	12.18	**≤.001**	.229	5.10	.027	.076	7.35	.009	.128	1.36	.252	.045	3.06	.087	.060
Statue	22.25	**≤.001**	.341	8.38	.006	.170	0.42	.517	.007	21.39	**≤.001**	.300	0.98	.329	.033	7.69	.008	.138
Design Fluency	28.07	**≤.001**	.395	25.17	**≤.001**	.380	3.03	.087	.047	9.94	.003	.166	.004	.950	.000	9.47	.003	.165
Knock & Tap	18.18	**≤.001**	.297	19.84	**≤.001**	.326	12.70	**≤.001**	.170	6.75	.012	.119	0.11	.742	.004	8.79	.005	.155
-Knock & Tap-part 1	9.99	.003	.189	16.65	**≤.001**	.289	13.64	**≤.001**	.180	1.89	.175	.036	0.46	.501	.016	5.61	.022	.105
-Knock & Tap-part 2	20.28	**≤.001**	.321	17.97	**≤.001**	.305	6.98	.010	.101	9.77	.003	.163	.001	.975	.000	9.21	.004	.161
Language	37.29	**≤.001**	.464	32.70	**≤.001**	.444	10.80	**≤.01**	.148	11.53	**≤.01**	.187	0.73	.398	.025	7.60	**≤.01**	.137
Phonological Processing	14.93	**≤.001**	.258	13.78	**≤.001**	.252	4.97	.029	.074	7.71	.008	.134	0.01	.922	.000	6.62	.013	.121
Speeded Naming	26.77	**≤.001**	.384	27.64	**≤.001**	.403	10.57	.002	.146	4.40	.041	.081	.023	.881	.001	5.13	.028	.097
Comprehension of Instructions	92.08	**≤.001**	.682	48.61	**≤.001**	.542	16.34	**≤.001**	.209	17.64	**≤.001**	.261	1.45	.238	.048	6.30	.015	.116
Repetition of Nonsense Words	4.44	.041	.094	2.70	.108	.062	0.34	.562	.005	1.43	.237	.028	0.67	.419	.023	.51	.479	.011
Verbal Fluency	32.60	**≤.001**	.431	13.33	**≤.001**	.245	2.94	.091	.045	17.81	**≤.001**	.263	3.09	.089	.097	5.54	.023	.103
Verbal Fluency-Semantic	35.80	**≤.001**	.454	17.58	**≤.001**	.300	2.00	.162	.031	17.11	**≤.001**	.255	1.98	.170	.064	7.148	.010	.130
Verbal Fluency-Phonemic	12.41	**≤.001**	.224	2.38	0.13	.055	3.86	.054	.059	8.28	.006	.142	4.41	.045	.132	.459	.501	.009
Oromotor Sequences	21.47	**≤.001**	.333	19.91	**≤.001**	.327	11.66	.001	.158	4.61	.037	.084	0.24	.627	.008	3.31	.075	.064
Comprehension of Sentence Structure	17.34	**≤.001**	.287	15.28	**≤.001**	.272	4.12	.047	.062	8.34	.006	.143	.075	.786	.003	7.21	.010	.131
Visuospatial Processing	12.91	**≤.01**	.231	21.81	**≤.001**	.347	3.82	.055	.058	2.04	.159	.039	.859	.362	.029	6.59	.013	.121
Design Copying	6.65	.013	.134	10.59	.002	.205	1.15	.287	.018	2.12	.152	.041	.463	.501	.016	5.41	.024	.101
Arrows	20.06	**≤.001**	.318	23.19	**≤.001**	.361	10.84	.002	.149	2.93	.093	.055	.062	.805	.002	3.03	.088	.059
Block Construction	7.27	.010	.145	11.89	**≤.001**	.225	4.45	.039	.067	1.13	.292	.022	.688	.414	.023	3.75	.058	.073
Route Finding	2.74	.105	.060	5.72	.021	.123	0.75	.390	.012	0.59	.445	.012	.271	.607	.009	2.07	.157	.041
Visual Recognition	.029	.866	.001	5.14	.029	.111	0.55	.461	.009	0.02	.882	.000	2.59	.118	.082	3.75	.059	.073
Sensorimotor Functions	23.75	**≤.001**	.356	20.54	**≤.001**	.334	6.38	.014	.093	9.49	**≤.01**	.160	.006	.938	.000	11.76	**≤.001**	.197
Fingertip Tapping	17.04	**≤.001**	.284	16.73	**≤.001**	.290	2.89	.094	.045	7.19	.010	.126	.000	.986	.000	9.88	.003	.171
Imitating Hand Positions	11.53	**≤.001**	.212	11.33	.002	.217	0.27	.603	.004	9.207	.004	.156	.050	.825	.002	11.04	.002	.187

Continued

Imitating Hand Positions-Preferred Hand	11.74	**≤.001**	.215	10.96	.002	.211	0.62	.432	.010	8.62	.005	.147	.069	.794	.002	9.58	.003	.166
Imitating Hand Positions-Non-preferred Hand	6.97	.011	.140	9.78	.003	.193	0.046	.832	.001	7.44	.009	.130	.025	.874	.001	11.21	.002	.189
Visuomotor Precision	30.67	**≤.001**	.416	23.88	**≤.001**	.368	4.80	.032	.072	11.93	**≤.001**	.193	.270	.607	.009	7.68	.008	.138
Manual Motor Sequences	7.68	.008	.152	24.20	**≤.001**	.371	9.22	.003	.130	0.57	.453	.011	1.15	.291	.038	8.32	.006	.148
Finger Discrimination-Preferred Hand	11.97	**≤.001**	.218	7.61	.009	.157	6.40	.014	.094	4.94	.031	.090	.292	.593	.010	2.56	.116	.051
Finger Discrimination-Non-preferred Hand	8.99	.004	.173	4.58	.038	.101	1.44	.235	.023	5.38	.024	.097	.560	.460	.019	2.52	.119	.050
Memory and Learning	61.65	**≤.001**	.589	42.43	**≤.001**	.509	8.39	**≤.01**	.119	16.09	**≤.001**	.244	.202	.657	.007	12.33	**≤.01**	.204
Memory for Faces	24.69	**≤.001**	.365	9.14	.004	.182	.099	.755	.002	24.27	**≤.001**	.327	3.73	.063	.114	9.79	.003	.170
Immediate Memory for Faces	34.62	**≤.001**	.446	9.06	.004	.181	.669	.416	.011	22.83	**≤.001**	.314	7.47	.011	.205	4.64	.036	.088
Delayed Memory for Faces	11.36	.002	.209	6.45	.015	.136	.054	.817	.001	12.75	.001	.203	.536	.470	.018	8.34	.006	.148
Memory for Names	0.36	.551	.008	12.28	**≤.001**	.231	2.52	.117	.039	0.259	.613	.005	5.88	.022	.169	4.33	.043	.083
Immediate Memory for Names	0.23	.631	.005	9.51	.004	.188	1.93	.170	.030	0.07	.792	.001	5.61	.025	.162	4.16	.047	.080
Delayed Memory for Names	0.33	.567	.008	3.70	.061	.083	3.49	.066	.053	1.62	.209	.031	1.28	.266	.042	.516	.476	.011
Narrative Memory	91.00	**≤.001**	.679	44.85	**≤.001**	.522	4.00	.050	.061	46.82	**≤.001**	.484	1.55	.222	.051	22.79	**≤.001**	.322
Sentence Repetition	69.05	**≤.001**	.616	22.97	**≤.001**	.359	10.86	.002	.149	21.23	**≤.001**	.298	3.98	.055	.121	4.29	.044	.082
List Learning	20.45	**≤.001**	.322	28.86	**≤.001**	.413	10.03	.002	.139	4.06	.049	.075	.032	.859	.001	7.52	.009	.135
Immediate List Memory	12.72	**≤.001**	.228	24.50	**≤.001**	.374	10.51	.002	.139	1.23	.272	.024	.189	.667	.006	5.32	.025	.100
Delayed List Memory	16.60	**≤.001**	.279	30.51	**≤.001**	.427	0.854	.359	.014	2.38	.129	.046	.078	.782	.003	3.52	.067	.060
Visual Memory	3.63	.063	.078	0.01	.911	.000	0.88	.352	.014	2.34	.132	.045	2.52	.123	.080	.166	.685	.003
Immediate Memory for Names	0.23	.631	.005	9.51	.004	.188	1.93	.170	.030	0.07	.792	.001	5.61	.025	.162	4.16	.047	.080
Delayed Memory for Names	0.33	.567	.008	3.70	.061	.083	3.49	.066	.053	1.62	.209	.031	1.28	.266	.042	.516	.476	.011
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Sentence Repetition	69.05	**≤.001**	.616	22.97	**≤.001**	.359	10.86	.002	.149	21.23	**≤.001**	.298	3.98	.055	.121	4.29	.044	.082
List Learning	20.45	**≤.001**	.322	28.86	**≤.001**	.413	10.03	.002	.139	4.06	.049	.075	.032	.859	.001	7.52	.009	.135

Raw scores were used in MANCOVA analysis. Significant differences appear in boldface. p values for controlling multiple comparison effect are $p < 0.01$ for NEPSY domains and $p \leq 0.001$ for NEPSY subtests. ASD = autism spectrum disorder; ASD + ADHD = comorbid ASD and ADHD; ADHD = attention deficit hyperactivity disorder; TD = typically developing children.

lower than TD group in all NEPSY Domain Scores (Attention and Executive Function, Language, Visuospatial Processing, Sensorimotor, and Memory and Learning). We also found a trend of lower performance of ASD group in comparison to TD group in all NEPSY subtests. There were statistically significant differences between children with ASD and TD children in all subtests except Repetition of Nonsense Words, Design Copying, Block Construction, Route Finding, Visual Recognition, Imitating Hand Positions (non-preferred hand), Manual Motor Sequences, Finger Discrimination (non-preferred hand), Delayed

Memory for Faces, Memory for Names and Visual Memory (Table 2 & Table 3).

ASD + ADHD group compared with TD group. ASD + ADHD group scored significantly lower than TD group in all NEPSY Domain Scores. There was also a trend of lower performance of ASD + ADHD group in comparison to TD group in all NEPSY subtests. Statistically significant differences were found in all subtests except on Statue, Repetition of Nonsense Words, Phonemic Verbal Fluency, Design Copying, Route Finding, Visual Recognition, Imitating Hand Positions, Finger Discrimination, Memory for Faces, and Visual Memory (Table 2 & Table 3).

ADHD group compared with TD group. ADHD group scored significantly lower than TD group in NEPSY Domain Scores of Attention and Executive Function, Language, and Memory and Learning. On Attention and Executive Functions domain ADHD group scored significantly lower than TD group in Response Set, Knock & Tap subtest, and on Language domain in Comprehension of Instruction subtest (Table 2 & Table 3).

ASD group compared with ADHD group. ASD group scored significantly lower than ADHD group in all NEPSY Domain Scores except Visuospatial Processing. ASD group scored significantly lower than ADHD group in the subtests of Auditory Attention and Response Set, Statue, Comprehension of Instruction, Verbal Fluency, Visuomotor Precision, Memory for Faces, Narrative Memory, and Sentence Repetition (Table 2 & Table 3).

ASD group compared with ASD + ADHD group. There were no significant differences found between these two groups (Table 2 & Table 3).

ADHD group compared with ASD + ADHD group. ADHD group scored significantly higher than ASD + ADHD group in all NEPSY Domain Scores except Visuospatial Processing. Specifically, ADHD group scored significantly higher than ASD + ADHD group in the subtests of Auditory Attention and Response Set, and Narrative Memory (Table 2 & Table 3).

4. Discussion

We compared the neuropsychological profiles of attention and executive function, language, visuospatial processing, sensorimotor function, and memory in Egyptian children with ASD, ASD + ADHD, ADHD, and TD employing a single neuropsychological battery. Whilst Egyptian children with ASD and ASD + ADHD demonstrated generalized impairment on neuropsychological performance, compared to TD children, we did not find specific differences between children with ASD and children with ASD + ADHD. Our results, however, suggest that compared to TD children, some neuropsychological abilities, such as planning, hand motor coordination, and verbal working memory, may worsen, in children with ASD + ADHD. In contrast, compared to TD children, problems in some neuropsychological abilities, such as verbal fluency, hand praxis, finger gnosis, and face memory may be mitigated in children having both ASD and ADHD.

4.1. Attention and Executive Function Domain

Attention and executive function is a broad term and it refers to higher order cognitive skills, which are important in order to maintain goal-directed performance in new or complex situations (Hunter, Edidin, & Hinkle, 2012). Similar to previous neuropsychological studies of children with ASD (Ambery, Russell, Perry, Morris, & Murphy, 2006; Barron-Linnankoski et al., 2015; Joseph, McGrath, & Tager-Flusberg, 2005; Korkman et al., 1998; Mahone, Powell, Loftis, Goldberg, Denckla, & Mostofsky, 2006; Narzisi et al., 2013; Ozonoff et al., 2004; Verté, Geurts, Roeyers, Oosterlaan, & Sergeant, 2006), Egyptian children with ASD and ASD + ADHD performed significantly poorer than TD children in tasks requiring selective auditory attention, maintaining the auditory attention and shifting the attention between different auditory demands as well as motor persistence and inhibition. Additionally, slower non-verbal fluency and visual scanning as well as poorer non-verbal problem solving skills of children with ASD and ASD + ADHD compared to the TD children might be explained by the nature of NEPSY tasks: these tasks depend mainly on strategic generation of designs and/or plans that are not previously stored in memory and therefore require flexible, non-routinized imaginativeness. There have been mixed evidence of design fluency, visual attention, and non-verbal problem solving with some previous studies reaching to similar results as our study (Hooper et al., 2006; Joseph et al., 2005; Losh et al., 2009; Narizi et al., 2013; Planche and Lemonnier, 2012) and others contradicting it (Barron-Linnankoski et al., 2015; Kleinhams, Akshoomoff, & Delis, 2005; Losh et al., 2009; Planche and Lemonnier, 2012; Turner, 1999), further research is warranted in this area. The generalized and profound impairment of attention and executive function in children with ASD and ASD + ADHD can be attributed to perseverative characteristics of ASD (Corbett, Constantine, Hendren, Rocke, & Ozonoff, 2009; Happé, Booth, Charlton, & Hughes, 2006) and/or failure to use the language for self-regulation. Weakness in verbal working memory (i.e., verbal self-reminding) can make children with ASD susceptible to errors in executive tasks (Joseph, McGrath, & Tager-Flusberg, 2005; Liss et al., 2001).

In addition to the fact that children with ASD and ASD + ADHD performed significantly less accurately than TD children, they also scored lower than children with ADHD in tasks requiring auditory attention, motor inhibition, and changing response style. It is possible that ASD symptoms in children with or without ADHD worsen both the impulsivity control and the motor and cognitive flexibility. In consistence with earlier findings, Egyptian children with ADHD scored lower than TD children on Attention and Executive Function domain, specifically in tasks requiring motor inhibition, which is the core symptom of impulsivity in ADHD (Happé et al., 2006; Sergeant, Geurts, & Oosterlaan, 2002; Tsal, Shalev, & Mevorach, 2005; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005; Youngwirth, Harvey, Gates, Hashim, & Friedman-Weieneth, 2007). Executive function impairments in children with ADHD might also be due to deficit in inhibitory control (Buhler et al., 2011; Happé, Booth, Charlton,

& Hughes, 2006).

4.2. Language Domain

Our results demonstrated that children with ADHD did not show as wide-ranging language difficulties as we expected based on earlier studies (e.g. Kim & Kaiser, 2000; Purvis & Tannock, 1997). However, this study confirmed earlier findings (e.g., Barini & Hage, 2015; Purvis & Tannock, 1997) that children with ADHD have verbal comprehension difficulties. It is of note that we used Comprehension of Instructions subtest, which demands the ability to receive, process, and execute instructions of increasing syntactic complexity, which may have further increased the working memory load. Previously Barini and Hage (2015) suggested that verbal comprehension difficulties in ADHD are connected with weak verbal working memory. However, in our study, children with ADHD did not perform significantly weaker than TD children in verbal memory tasks. Others suggested the reason for language difficulties in ADHD is impulsivity (Geurts & Embrechts, 2008), which might be a factor behind the weak verbal comprehension abilities of children with ADHD found in our study.

Our finding of poorer performance in children with ASD compared to TD children on Language domain is consistent with previous studies using NEPSY (Hooper et al., 2006; Korkman et al., 2007; Narzisi et al., 2013). Also, our results concur with other studies on language deficits in children with ASD and expanded the findings as affecting also children with ASD + ADHD. In line with earlier studies that compared children with ASD and ASD + ADHD to TD children (Ambery et al., 2006; Barron-Linnankoski et al., 2015; Bramham et al., 2009; Geurts et al., 2004; Tager-Flusberg, 2004; Narzisi et al., 2013; Rumsey & Hamburger 1988, 1990; Saalasti et al., 2008; Turner 1999; Verte et al., 2006), both groups had wide-ranging language difficulties in generating words of semantic category, processing and responding to verbal instruction of increasing syntactic complexity, accessing and producing familiar words, understanding the grammar of sentences with increasing complexity, and in rhythmic oromotor coordination. Similarly, our ASD and ASD + ADHD samples demonstrated deficits in identifying words from segments and forming an auditory gestalt (Tager-Flusberg, 2004; Narzisi et al., 2013) and deficits in phonemic fluency (Tager-Flusberg, 2004; Schmidt, Kopelioff, Winterrowd, Pennington, Hepburn, & Rojas, 2008). However, in contrast, results from a study by Barron-Linnankoski and colleagues (2015) found intact comprehension of instructions in their ASD sample, which might be attributed to IQ differences when compared to our sample. In our sample, children with ASD and ASD + ADHD showed intact ability of encoding and decoding a sound pattern (repetition of nonsense words). Whitehouse, Barry and Bishop (2008) concluded that impairment in repetition of nonsense words is seen only in some children with ASD and depends on the ASD symptom severity and impairments in structural language. This conclusion provides a possible explanation of why this ability was spared in our sample given that we only included high-functioning children with ASD in our

study. Nevertheless, our finding should be interpreted with caution, as we used the original English audiotape of nonsense words of NEPSY instead of inventing an Arabic one. We found children with ASD or ASD + ADHD to have difficulties in many aspects of language, such as semantics and syntax that undoubtedly have an effect on their linguistic competence. In addition to impaired social and communication skills (APA, 2013), language difficulties may further affect children's communication with peers and their school performance.

4.3. Visuospatial Processing Domain

In line with the earlier ASD studies (Hooper, Poon, Marcus, & Fine, 2006; Korkman, Kirk, & Kemp, 2007; Narzisi et al., 2013), that used NEPSY, our sample of children with ASD and ASD + ADHD faired worse than TD children in their ability to judge line orientation. However, there is another study that employed another measure different from NEPSY showing contradicting results (Planche & Lemonnier, 2012). Thus, it is possible that the demands of shifting attention in the line orientation subtest of NEPSY (i.e., the variability of location and size of the lines), along with occasional slippages in visual attention and scanning, may negatively influence subjects' performance.

Further, our results showed that children with ASD and ASD + ADHD might have intact object recognition and perception, and understanding of visuospatial relationships and directionality, in line with previous studies (Kuusikko-Gauffin et al., 2011; Losh et al., 2009). Also, our results regarding impairment in abilities of copying two-dimensional geometric figures in ASD are consistent with another study (Narzisi et al., 2013). The ability to reproduce three-dimensional block constructions from models and pictures was found to be intact in our sample of children with ASD but not in ASD + ADHD relative to TD children. It is possible that the ADHD symptoms might hinder the strategic planning capability of children with ASD. Relatively intact visuospatial processing may thus be one of the areas of strength in children with ASD and it could be employed in interventions, such as using pictorial information instead of lexical information.

4.4. Sensorimotor Domain

Similar to Youngwirth and colleagues (2007), we did not find any difference between children with ADHD and TD children in sensorimotor abilities. For children with ASD and ASD + ADHD, we found them to perform poorer than TD children particularly in fingertip tapping and visuomotor tasks. This replicates the finding of Ham, Corley, Rajendra, Carletta, & Swanson (2008) and Hooper, Poon, Marcus, & Fine, (2006) but was inconsistent with the results of another study (Narzisi et al., 2013). Impairment in Fingertip Tapping subtest might be related to deficits in executive function, set shifting, and lack of cognitive flexibility in ASD. The visuomotor subtest examined both speed and accuracy, which might have contributed to a slower and/or less accurate performance of children with ASD. Additionally, children with ASD + ADHD encountered difficulties in imitating series of rhythmic movements but this was not the case

in children with pure ASD and could be related to impaired executive function in ADHD.

4.5. Memory and Learning Domain

Memory for faces was significantly impaired in our ASD sample, confirming the findings of previous research (Barron-Linnankoski et al., 2015; Blair, Frith, Smith, Abell, & Cipolotti, 2002; Garcia, 2001; Hooper, Poon, Marcus, & Fine, 2006; Narzisi et al., 2013; O'shea, Fein, Cillesen, Klin, & Schltz, 2005; Williams, Goldstein, & Minshew, 2006a). Impairment of recalling names was only found in children with ASD + ADHD but not in children with pure ASD. This may be the result of the additive effect of ADHD symptoms. Our findings are also consistent with previous studies (Barron-Linnankoski et al., 2015; Blair et al 2002; Garcia, 2001; Hooper, Poon, Marcus, & Fine, 2006; Korkman, Kirk, & Kemp, 1998; Minshew and Goldstein 2001; Narzisi et al., 2013; O'shea et al., 2005; Williams, Goldstein, & Minshew, 2006a; Williams, Goldstein, & Minshew, 2006b). Deficits in verbal working memory, difficulties in developing strategies for free recall of information, and difficulties in organizing words and resisting interference are further reasons to favor pictorial information instead of lexical in the interventions and in the teaching materials provided for children with ASD (Bowler, Matthews, & Gardiner, 1997; Barendse et al., 2013; Narzisi et al., 2013).

5. Conclusion

Egyptian children with ASD, ASD + ADHD, and ADHD demonstrated generalized impairment on neuropsychological performance, which is consistent with reports from other countries. Rather unexpectedly, we did not find statistically significant differences between children with ASD and children with ASD + ADHD in neuropsychological performance. Whilst ADHD symptoms may not automatically increase the neuropsychological deficits in children with ASD, our results suggest that the presence of ADHD symptoms in children with ASD could worsen their ability to plan, hand motor coordination, and memorizing names. Nevertheless, these symptoms may mitigate the difficulties that ASD children may have in other neuropsychological areas, such as verbal fluency, hand praxis, finger gnosis, and face memory. Our findings may well impact management plans for ASD: As communication difficulty is one of the most impairing features of ASD, language skills of children should be carefully assessed when planning interventions for these patients. As such, relatively intact visuospatial processing may be one of the areas of strength in children with ASD, it could be employed in interventions, such as using pictorial information instead of lexical information.

6. Suggestions for Future Research

In spite of the limitations inherent to our study including the small sample size of each diagnostic group, this is the first study to compare the neuropsychological abilities of ASD, ASD + ADHD, ADHD and typical development in Middle

Eastern children. Future studies with larger sample sizes are therefore warranted to validate the NEPSY in Middle East countries and to further compare the neuropsychological performance of children of ASD, ASD + ADHD, and ADHD.

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Conflict of Interest

The authors report no conflicts of interest.

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The Influence of Dynamic Signs on Cyclists' Braking Rates: A Systematic Study Using Immersive Virtual Reality

Hiroshi Watanabe[1*], Nana Ito[1], Hiroyasu Ujike[1], Reiko Sakata[2], Munetaka Nishihira[2], Tsutomu Matsubara[2]

[1]Human Informatics Research Institute, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan
[2]Industrial Design Center, Mitsubishi Electric Corporation, Kamakura, Japan
Email: *h.watanabe@aist.go.jp

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Abstract

Dynamic signs are signs that incorporate movement and are projected from a vehicle toward pedestrians or on the wall or floor of a public facility. Projection-based signage systems that are easy to install and move are becoming increasingly practical as a result of recent improvements in projector technology, and there is a need to accumulate knowledge on such signs and their interactions with people from an ergonomic perspective. This paper studies dynamic signs projected from parked cars (these signs warn that the car is about to reverse or open a door) with the goal to clarify the influence of these dynamic signs on the braking behavior of cyclists riding near the cars. In an experiment, we placed several parked cars in an immersive virtual reality space and created a system that allowed participants to move through the virtual space by steering a real bicycle. As participants rode past the row of parked cars, they took evasive actions to avoid a collision by actually operating the brake and handlebar in response to signs projected from cars warning that the car was about to reverse or open a door. For the experimental conditions, we looked at participant age groups, the method used to display the signs, and the timing of displaying the sign. The results suggest that the various experimental conditions produce different effects, and our discussion focuses on brake selection rates as a measure of cyclists' responses to events.

Keywords

Dynamic Signs, VR, Braking Rates, Risk Assessment, Effect of Aging, Cognitive Decline, Simulator Sickness

1. Introduction

Accidents involving vehicles and pedestrians can occur while cars are parked,

and when cars are in motion. According to a study by the Institute for Traffic Accident Research and Data Analysis (2016), about 6200 fatal accidents involving pedestrians and automobiles took place in car parks between 2010 and 2014 in Japan. Reports characterize the circumstances surrounding these accidents as including many cases with pedestrians over the age of 65 when a car is reversing, or pedestrians under the age of six when a car starts moving forward. At the same time, there are also reports that more than half of the accidents involving stationary vehicles in 2014 had doors opening as a factor (2325 accidents out of a total of 3800) (Institute for Traffic Accident Research and Data Analysis, 2015). Cyclists were particularly susceptible to such accidents, accounting for 67% of cases, with motorcycles and mopeds accounting for a further 19%. The party at fault in door-opening-related accidents is not necessarily the driver; it can also be any passenger, including children.

One possible solution for preventing such accidents is for parked vehicles to display signs warning pedestrians and cyclists of their impending actions. In this case, attention is drawn to the stationary vehicle and the meaning of the warning sign is conveyed, allowing the pedestrian or rider to take evasive action. For this use case, the design of such signs must consider the subsequent evasive action as well as how readily the signs can be noticed and understood.

Our previous work used real video footage of dynamic sign information warning that a door will open being projected onto the road to obtain data on the occurrence of observers' brake selection behavior, from the perspective of subjective reports and the time taken to make a decision (Sakata, Matsubara, Watanabe, Ito, & Ujike, 2016). The results suggested that both the timing and animation of the sign influence the awareness of the sign and the evasive action taken by the cyclist (including the type and the time taken to reach a decision).

This study builds on the earlier work in three ways: 1) we add scenarios in which cars move in reverse as well as car doors opening; 2) we obtain data under consistent experimental conditions by using an immersive virtual reality device to arrange vehicles (rendered using three-dimensional computer graphics) and control how the signs are displayed; and 3) we obtain quantitative data on brake and steering operations by having participants used a real bicycle to move through the virtual reality space.

2. Methods

2.1. Participants

Bicycle-riding behavior under ordinary conditions draws on various cognitive functions such as visual attention, time perception, spatial perception, motor control for equipment operation, and decision making. It is thus important to clarify the effect of aging on that behavior. This is of particular concern in Japan because dementia rates have been increasing rapidly with the aging of the population, as is happening in other countries (Miyanaga, 1997). When looking at the rate of dementia by age in Japan, the rate of dementia among people less than 40

years old is 0.2%, among those 40 - 59 years old is 2%, and among those 60 - 79 years old is 16% (Ministry of Health, Labour and Welfare, 2009). This epidemiological fact suggests that the characteristics of cognitive function change with aging; because of this, we grouped participants by age, with divisions at 40 and 60 years.

A total of 100 participants were divided into three groups: 20 - 39 years old (n = 34), 40 - 59 years old (n = 35), and 60 - 79 years old (n = 31). We recruited persons with normal vision, hearing, and walking ability who ride a bicycle in the course of their daily life, offering financial compensation for participation. On the day of the tests, we verified that there were no impediments to participation, using a questionnaire about their physical condition on the day, as well as using Landolt rings from a distance of 5 m and the Stereo Fly Test (Stereo Optical Co., Inc.) to examine visual acuity and stereo vision. No participants had any prior knowledge of the content of the test. The content of the test was approved by the Ergonomics Committee of the National Institute of Advanced Industrial Science and Technology (AIST), and we obtained written consent to participate in the test from each participant. **Table 1** shows the number of men and women in each age group and visual acuity scores. Note that the results of the visual acuity exam using Landolt circles are expressed differently in Japan than they are in Europe and North America. For example, the Japanese visual acuity scores 0.5, 1.0 and 2.0 would be expressed as 20/40, 20/20 and 40/20, respectively, in Europe and North America.

2.2. Pretest Examinations

We examined the following items before the tests using the virtual reality device: 1) the Cognitive Aging Test developed by AIST (AIST-CAT), and 2) the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975). Both of these tests evaluate cognitive functioning, but the MMSE is used as an index of cognitive impairment and has been shown to be inappropriate for functional assessment in healthy elderly populations, the majority of whom score full points for sensory faculties (Suto, Kumanda, Kitajima, & Sato, 2008). Accordingly, we chose to use this test in conjunction with AIST-CAT, which was developed to measure cognitive decline due to aging in healthy elderly people. **Table 1** shows the results of these two cognitive tests for each age group.

2.3. VR Experiments

This section describes the test, which involves moving through a virtual reality space using a real bicycle. This test was the principal focus of this paper.

Device. Test video images were projected from 4000-lm projectors (NP-M402XJD by NEC) onto four 3-m square screens placed to the left and right of the viewer as well as to the front and on the floor, using the CAVE immersive virtual reality device (produced by the University of Illinois). Participants viewed these projections through glasses that had been polarized with the circular light polarization method (**Figure 1**). The position of participants' heads was meas-

Table 1. Participants characteristics and pretest results by age group.

		20 - 39 years old	40 - 59 years old	60 - 79 years old
Men	*N*	18	16	16
	Distance vision	1.2 ± 0.4	1.2 ± 0.3	1.1 ± 0.2
	Stereo vision	12.7 ± 0.8	12.0 ± 1.8	10.9 ± 2.4
	Cognitive test 1	141 ± 7.6	139 ± 7.1	121 ± 14.8
	Cognitive test 2	29.1 ± 0.9	28.3 ± 1.2	27.8 ± 1.9
Women	*N*	16	19	15
	Distance vision	1.1 ± 0.2	1.3 ± 0.4	1.0 ± 0.3
	Stereo vision	12.8 ± 0.4	12.6 ± 1.2	11.6 ± 2.4
	Cognitive test 1	143 ± 4.7	137 ± 14.7	127 ± 17.8
	Cognitive test 2	29.3 ± 0.8	28.2 ± 1.4	28.2 ± 2.0

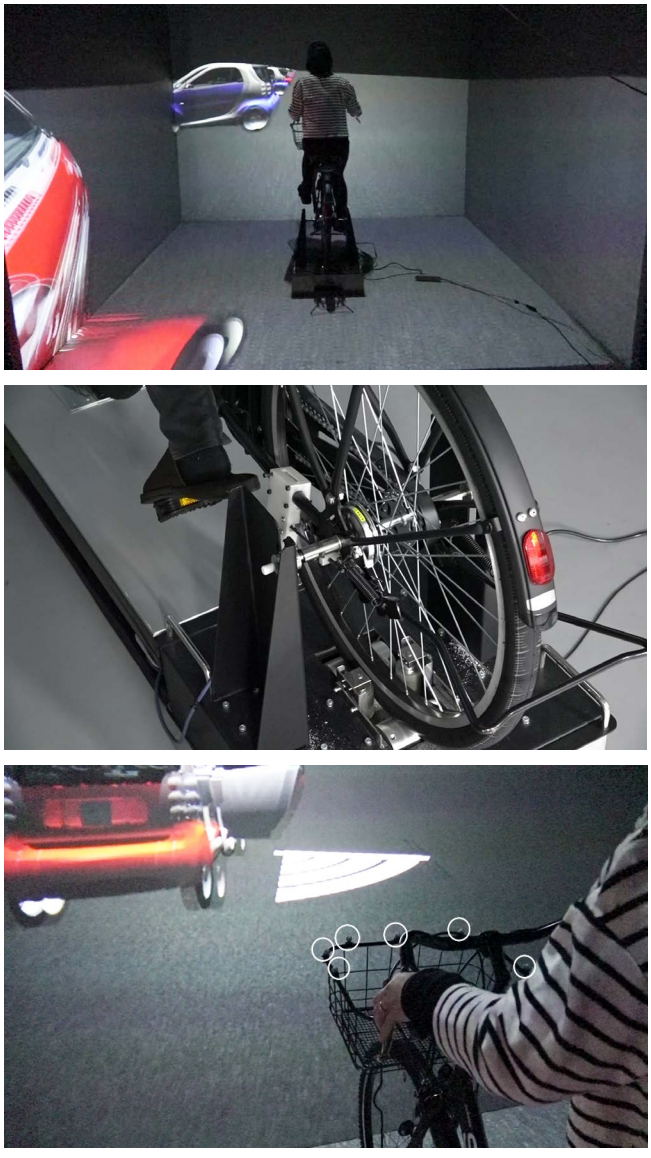

Figure 1. (Top) The cycleStreet system installed in the CAVE. (Middle) The cycleStreet roller for detecting the rotation speed of the back wheel. (Bottom) The markers (highlighted by circles) for measuring the bicycle's direction of movement.

ured without contact at a sampling rate of 120 Hz using the Vicon system (Vicon) and position data was transmitted to the CAVE system via an Ethernet connection (average height of top of head was about 154 cm). This information was used to correct rendering distortions based on the position of the test participant's head. Movement through the virtual reality space was achieved via the Cycle Street City Multi-Purpose Virtual Cycling System (2016) (Flovel, 2016). With this system, speed data are obtained from a sensor on the back wheel of the bicycle that measures the rotation speed, while braking data are obtained from the length of the brake wire. The maximum velocity of the bicycle was restricted to 10 km/h for the simulation to reduce the differences between subjects. The direction of movement was determined by converting position data for the Vicon system marker attached to the front of the bicycle to a quaternion in the three-dimensional space.

Procedure. Participants were asked to control the bicycle so as to ride to the right of parked cars that were placed at irregular intervals along a straight line via computer graphics. The data for the parked cars was all derived from 3D models (by CG Databank) of the "Smart" make of car, which is 1.51 m wide and 2.5 m long. The average spacing between parked cars was 4.5 m.

As participants rode through the space, a car door might open or a car might start reversing. These events were accompanied by the display of warning signs, and participants were asked to either stop or avoid collision at their own discretion. Participants had no prior knowledge about which cars might initiate these events. Cars whose doors opened were parked parallel to the direction of travel, whereas reversing cars were parked perpendicular to the direction of travel. However, all cars were of the same shape, painted either red or blue at random, and there were no clues indicating the relation between cars and events.

The signs indicating a car door about to open were 1.9 m wide and 1.9 m high (3.61 m^2), while the dimensions of the signs indicating a car about to reverse were 2.4 m wide by 1.5 m high (3.60 m^2). The timing of sign display was either 3.2, 4.6, 5.9 or 7.2 s before the door opening or car reversing event. Our previous work (Sakata et al., 2016) used real video footage of dynamic sign information and employed timings of 0.5, 3 and 5 s. However, during a preliminary phase of this study, we found that shorter values were more likely to surprise participants and lead them to engage in sudden and hazardous handling and braking. We therefore added a margin of 2.7 s to the shortest time (0.5 s) and set timings at intervals of 1.3 s to generate 4 timings.

Two types of sign were prepared: animated and flashing. The duration of the frames making up each of the two display methods were as follows. When animated, both the door opening sign and the reversing sign consist of five frames displayed as a loop, with the first and last frames displayed for 0.3 s each and the intermediate frames displayed for 0.13 s each. When flashing, both the door opening sign and the reversing sign consist of two frames, each displayed for 0.5 s. These parameters are chosen because they agree with those of a prototype projection system that some of the authors are developing. These settings result

in both conditions (animated and flashing) having roughly the same frequency of 1 Hz (Figure 2), and this value is consistent within the range of 1 - 2 Hz specified by Japanese law.

To summarize, there are a total of 16 different stimulatory conditions: two events (door opening and car reversing), four display timings (3.2, 4.6, 5.9 and 7.2 s), and two display methods (animated and flashing). Each combination was presented three times over the course of the test, so that participants were asked to make a total of 48 decisions split over 12 sessions. Each session lasted about 4 min, so that the total test time was less than 4 h, including breaks.

We also monitored simulator sickness via a questionnaire, and participants who experienced extreme symptoms were allowed to withdraw. Participants filled out a Simulator Sickness Questionnaire (SSQ) (Kennedy, Lane, Berbaum, & Lilienthal, 1993) before the start of the first session. For participants who felt sick during the experiment and were unable to continue, we stopped the experiment immediately and asked the participant to fill out the SSQ again. Participants who completed all 12 sessions filled out the SSQ after the end of the final session. We first adopted this procedure after 34 participants had already completed the experiment, so only 66 participants filled out SSQs.

3. Results

3.1. Visual Acuity

We performed analysis of variance on the scores for the 5-m visual acuity exam using Landolt circles and the Stereo Fly stereo vision test (conducted as pretest examinations), using age group (20 - 39 years old, 40 - 59 years old, or 60 - 79 years old) and gender as the between-subjects factors. The two conditions did not have any significant main effects in either test (5-m visual acuity exam: age group $F(2,94) = 1.13$, $p > .05$; gender $F(1,94) = 0.13$, $p > .05$; stereo vision test: age group $F(2,94) = 1.90$, $p > .05$; gender $F(1,94) = 1.94$, $p > .05$), indicating no differences in the visual acuities of participants.

3.2. Cognitive Ability

Two tests were conducted to assess the cognitive abilities of the participants.

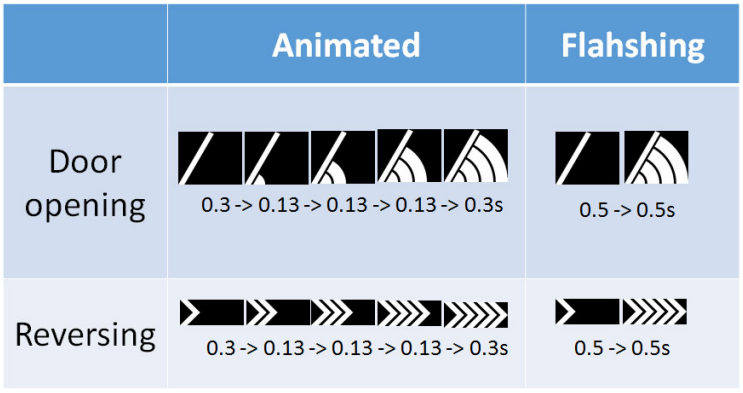

Figure 2. Methods for displaying dynamic signs.

AIST-CAT consists of five tasks (checking target stimuli, writing mirror letters, switching tasks, visual searches, and activity sequences), and we calculated scores for each individual as the total of the scores for each of these tasks. The MMSE test consists of 11 questions with a maximum score of 30 points, and assesses five areas: orientation, registration, attention and calculation, recall, and language (Folstein, Folstein, & McHugh, 1975). We calculated scores for each individual as the total of the scores for the 11 questions. Analysis of variance on the scores for these tests, taking age group and gender as the between-subjects factors (in the same way as for visual acuity), found significant main effects for the age group condition in both tests (AIST-CAT: $F(2,94) = 8.26$, $p < .01$; MMSE: $F(2,94) = 5.10$, $p < .01$). When we examined the difference between groups using post hoc multiple-comparison tests, the scores for the 60 - 79 year old age groups were significantly lower for both tests. Despite this difference, the average AIST-CAT scores for the elderly group in this experiment were relatively high (123.69 for men and 113.93 for women) compared with the typical score of 103.55 for the elderly in general (Adachi, Harada, Suto, Kumada, & Fujiwara, 2014). The same trend was evident in the MMSE scores, with the average scores for both men (27.44) and women (24.53) exceeding the 24-point cut-off for categorization as neurologically normal. Accordingly, although we did find a numerically significant difference between age groups, the older age group does not appear to consist of members that would be classed as cognitively impaired.

3.3. Withdrawal due to Visually Induced Motion Sickness

The data for the 66 participants who filled out the SSQ was categorized into two classes: 58 participants who completed all sessions and eight participants who dropped out. The SSQ consists of 16 questions on simulator sickness and participants responded to questionnaires in four-option multiple choice format. During analysis, the 16 items are classified using four subcategories ("Nausea," "Oculomotor," "Disorientation," and "Total"). Final scores are obtained by multiplying the raw scores for each subcategory by different factors (9.54 for Nausea, 7.58 for Oculomotor, 13.92 for Disorientation and 3.7 for Total). Total scores for the 3 (of 66) participants who completed all sessions were over 55, and we omitted these subjects' data in this section, because it seems likely that they forced themselves to complete sessions (Balk, Bertola, & Inman, 2013).

Figure 3 shows the average SSQ scores for all participants, participants who completed all sessions, and participants who dropped out.

We also conducted analysis of variance taking completion of all 12 sessions as the between-subjects factor, and the subcategory scores in each group as within-subject factors. The results of the analysis showed significant main effects for both completion ($F(1,61) = 28.60$, $p < .01$) and subcategory scores ($F(3,183) = 28.07$, $p < .01$). These results show that participants who dropped out clearly felt simulator sickness.

Significant interactions between these main effects were also shown, and so we conducted further examination of the simple main effects, which indicated sig-

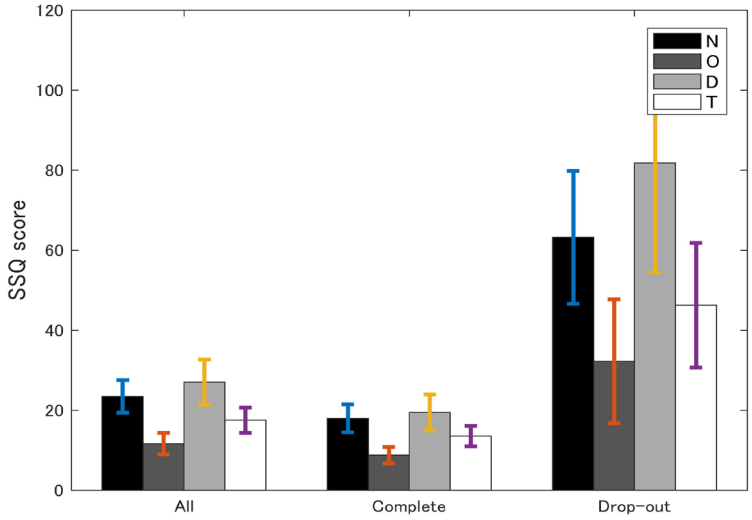

Figure 3. Average SSQ scores for all participants, those who completed all sessions, and those who dropped out.

nificant differences between subcategories in the responses of the drop-out group ($F(3,183) = 14.81$, $p < .01$). Multiple comparisons based on the Ryan-Einot-Gabriel-Welsch method showed significant differences between all pairs of subcategories.

Exposure time for VR, traveling distance in VR and total scores on the SSQ for the completed (resp., dropped-out) group are 28.45 min (13.11 min), 4.74 km (2.19 km), and 10.02 (46.25), respectively.

3.4. Evasive Actions While Riding through the Virtual Reality Space

Next, we discuss the effect on evasive behavior of signs warning of vehicle actions, displayed while participants ride a bicycle through the virtual reality space. This behavior is the main concern of this paper. **Figure 4** shows one session's worth of data for one participant as an example of the results we obtained. The top graph in this figure shows the length of the brake wire, and the bottom graph shows the angle of the handlebars. The horizontal axis shows the time (in minutes) elapsed since the start of the test, while the vertical lines indicate the times when warning signs were displayed. The points on each waveform that have been highlighted with circles are the singularities in the brake or handlebar state that occur immediately after the signs are displayed, as automatically detected by a signal processing package (Matlab by MathWorks). Note that the brake waveform patterns immediately after the start of the session and immediately before the end of the session are dummy data for the start and end of the test, and are not associated with the participant's responses.

The discussion below focuses on the brake responses, which occur prior to the handlebar operations. As discussed above, each of the 16 sets of stimulus parameters was presented three times. Thus, participants' possible responses can be quantified as brake selection rates of 0%, 33.3%, 66.6%, or 100% for each condition. **Figure 5** shows the average values calculated from all participants' res-

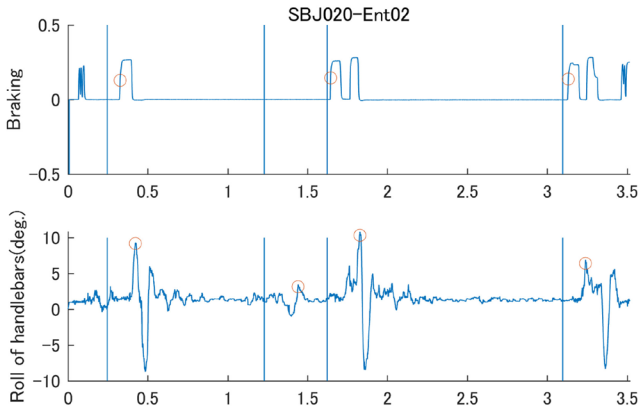

Figure 4. An example of braking and handlebar operations in response to signs. See main text for details.

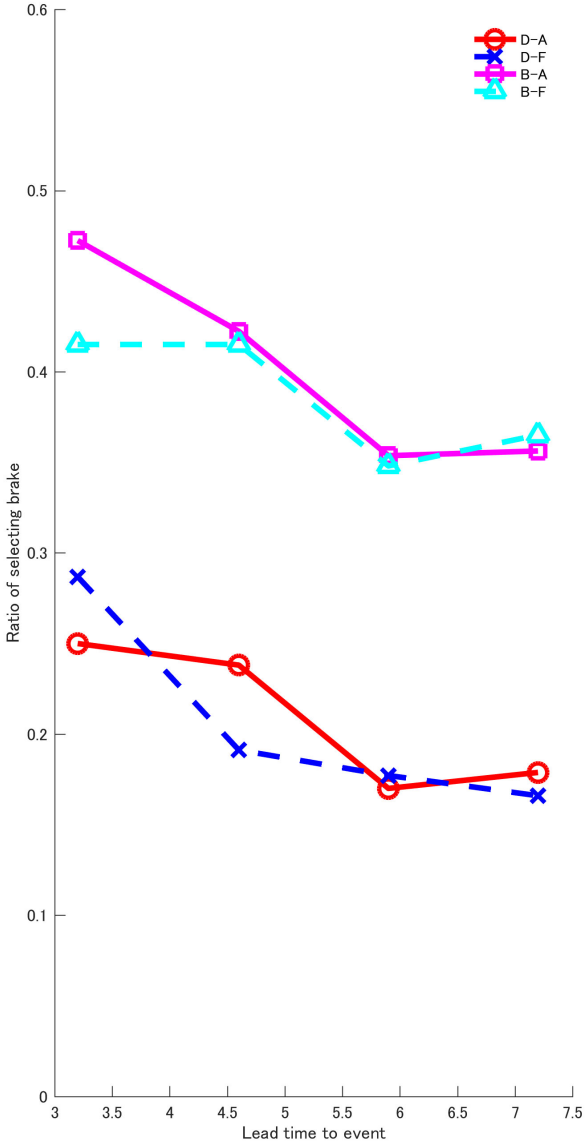

Figure 5. Brake selection rate trends according to display timing (average for all participants).

ponses as a function of the timing when the sign was displayed. The symbols in the graph (○, ×, □, and △) correspond to "door opening with animated sign," "door opening with flashing sign," "reversing with animated sign," and "reversing with flashing sign," respectively. Analysis of variance taking car behavior, sign type, and display timing as within-subject factors showed significant main effects for car behavior ($F(1,80) = 41.53$, $p < .01$) and the timing of when the sign was displayed ($F(3,240) = 14.65$, $p < .01$). Taken overall, these results suggest that the brake selection rate increases as the time interval between the sign and the event decreases, as well as in response to a car reversing. Since significant interactions were shown between the three factors ($F(3,240) = 2.67$, $p < .05$) we also conducted post hoc testing. The results showed that for a sign displayed 3.2 s before a car reversed, the brake selection rate was significantly higher when the sign was animated ($F(1,640) = 5.16$, $p < .05$).

Next, Figure 6 organizes the data above by age group. The symbols in the figure are the same as for Figure 5 and results are shown (from left to right) for the 20 - 39 year old, 40 - 59 year old, and 60 - 79 year old age groups. We conducted analysis of variance, again taking vehicle behavior, sign type, and display timing as within-subject factors (as in the previous paragraph), but this time analyzing each age group separately. The results showed significant differences in relation to vehicle behavior for all age groups (20 - 39 years: $F(1,29) = 22.88$, $p < .01$; 40 - 59 years: $F(1,29) = 9.90$, $p < .01$; 60 - 79 years: $F(1,20) = 10.89$, $p < .01$), with all age groups demonstrating higher brake selection rates when cars reversed. In

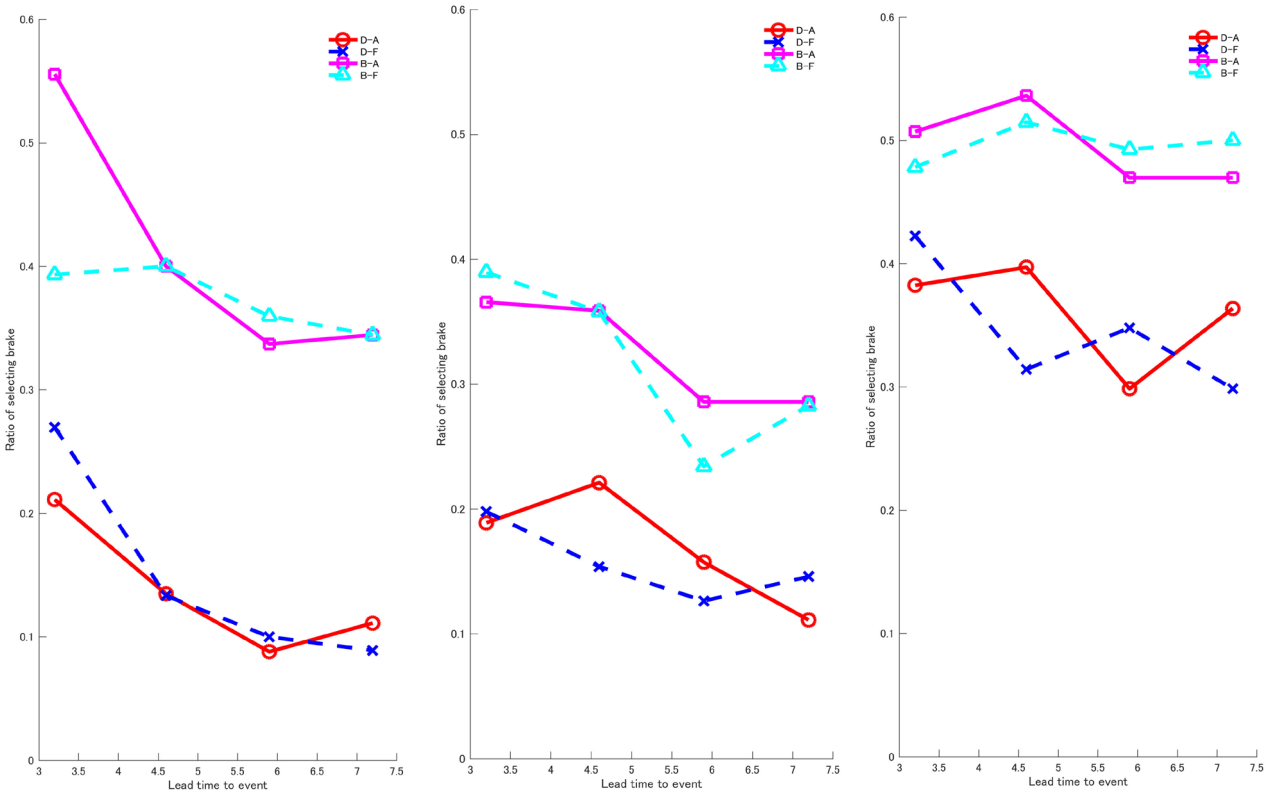

Figure 6. Brake selection rates by age group. From left to right: 20 - 39 years old, 40 - 59 years old, and 60 - 79 years old.

contrast, the timing of when the signs were displayed resulted in significant differences only for the 20 - 39 years and 40 - 59 years age groups ($F(3,87) = 9.56$, $p < .01$ and $F(3,87) = 4.54$, $p < .01$, respectively), suggesting older people have a constant brake response rate regardless of the timing ($F(3,60) = 1.65$, $p > .05$). Significant interactions were also apparent between the three conditions in the 20 - 39 years group ($F(3,87) = 4.45$, $p < .01$). Follow-up testing indicated that for warning signs displayed 3.2 s before a car reversed, animated signs had significantly higher brake selection rates ($F(1,232) = 16.47$, $p < .01$). This matches the pooled result, suggesting that the pooled result reflects the response characteristics of the younger age group.

4. Discussion

We have validated the effect on brake selection rates for different age groups of the following parameters: vehicle behavior, dynamic characteristics of the sign warning of imminent behavior, and the timing of displaying the warning sign. The test results showed that brake selection rates are higher when cars reverse, for all ages. This is likely because all age groups are aware that this type of action by a vehicle can cause a serious accident. Interestingly, the 60 - 79 years group had a higher brake selection rate in response to car doors opening than other age groups did, and the brake selection rate was not affected by the timing of when the sign was displayed. That is, it seems that this group's first response is to slow or stop when they perceive a sign warning of an imminent event. Aging affects a wide range of cognitive and behavioral characteristics, from a decline in sensory responses at the input stage (Shiota & Ikeda, 2008) such as lower range of accommodation, lower retinal illuminance, more light scattering, and slower scotopic adaption (Jackson, Owsley, & McGwin, 1999; Ujike & Sagawa, 2003) through to longer response times at the behavioral level. As a result of their self-perception of this kind of decline in their sensory and physical capabilities, it seems likely that older people pay greater attention to their surroundings and increasingly select cautious actions. This kind of psychological process is referred to as "hazard perception" in modern risk theory (Brown & Groger, 1988). In contrast, the 20 - 39 years group shows a tendency to switch between steering and braking, according to the timing of when the sign is displayed. The decision to halt the bicycle upon sensing danger is correct in and of itself, but panic braking can also lead to a dangerous halt, depending on the speed, mass, and road conditions. Hence, it may be necessary to carefully consider whether cars should constantly display signs warning of their impending actions. In some circumstances, there may be a need for sensing technology to detect the surrounding circumstances or the presence of an approaching pedestrian, bicycle, or motorbike.

Note that, in general, signs being animated or flashing seemed to have little effect on the brake selection rate. This result could open up a diverse range of options for sign design. In the process of deliberating more effective methods for displaying signs and establishing standardized guidelines, we anticipate that it

will be important to collect data under a wide range of conditions.

In summary, we discussed the influence of dynamic signs warning of the behaviors of a parking vehicle on the braking responses of cyclists riding in the VR space. The conditions varied in the experiments were type of vehicle behavior (door opening vs. reversing), method used to display the sign (animated vs. flashing), and the timing of displaying the sign. Our results showed that the participants were aware of the seriousness of avoidance, regardless of age, but the effect of timing on avoidance behavior varied according to age.

Due to improvements in projection technology, dynamic signs are now becoming popular for various applications, such as guidance for to users in public facilities (DesignCollector, 2012; Aledo, 2017; YouTube, 2013; Ecolight, 2016), information for drivers (Landscape + Urbanism, 2010; Laservision, n.d.), and warning pedestrians away from vehicles (TechCrunch, 2015). Currently, however, methods have not been standardized, particularly with respect to visibility, accessibility, effects on behavior, and expressiveness. These issues should be discussed to avoid haphazard signage.

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Assessing Racial Preferences in Movies: The Impact of Mere-Exposure and Social Identity Theory

Katherine Aumer, Devin Blas, Kelsea Huston, Christine Mabuti, Ning Hsu

Hawai'i Pacific University, Honolulu, HI, USA
Email: kaumer@hpu.edu

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Abstract

Current media attention on the lack of racial diversity in the movie and TV industry in the US suggests that there is an innate bias of Whitewashing in the US media by media executives (Jones, 2016). However, some have suggested that the Whitewashing is an audience preference. Is the preference for White actors a product of bias by media executives or driven by audience preferences? This study tested whether social identity theory or the mere-exposure effect would have an impact on the racial preference of actors for monoracial People of Color, Multiracial, and White individuals. We found a preference for White actors and Whitewashing, but this preference was only found for Western stories and by monoracial People of Color Minorities when they were exposed to Asian actors. These findings suggest that other factors, specifically cultural values may be important in understanding preference for White actors in the media.

Keywords

Whitewashing, Mere-Exposure, Social Identity Theory, Asian, Movies, Diversity, Casting

1. Introduction

The prevalence of preferential casting of White individuals for minority roles in the United States (US) film industry has been termed: "Whitewashing" (Whitewashing, 2016). Whitewashing has been apparent in the US film industry early on (Scherker, 2014). Examples can be seen as early as 1921, when Rudolph Valentino played a man of Arab descent in *The Shiek*. More recent examples can be seen with Johnny Depp playing Tonto, a Native American in the *Lone Ranger* (2013) and Scarlett Johansson playing Kusanagi, a Japanese woman in *Ghost in*

the Shell (2017). The arguments for why there is a preference for Whitewashing has targeted both movie producers who argue they would be unable to find financial support for their movies without casting predominantly White actors (Alexander, 2001; Horn, 2002; Samuels & Leland, 1999) and also targeting White moviegoers, who perceive movies without White actors as not appealing to them or their identity (Weaver, 2011). However, recent criticism has put doubt to the idea that all White actors are financially necessary for successful movies (Chow, 2016). A recent report has found that more diverse casted films actually perform financially better than predominantly White casted films and that there are many all White films that financially fail (Hunt & Ramon, 2015). Current continuation for Whitewashing in the US film industry could still be a product of industry habit; however, the argument that moviegoers prefer White actors is still tenuous and should be tested. Could it be that film industry executives are offering audiences predominantly White casted films because that is what the audiences want ("art reflecting life") or is the audience preferring White actors in their films because of the long history of seeing predominantly White actors in the movies ("life reflecting art")? The purpose of the following study is to answer this question.

2. Theoretical Background

Moviegoers may prefer to see movies with predominantly White actors because they are accustomed to seeing predominantly White actors in the movies and in the general media. Zajonc's (1968, 2001) theory of the mere-exposure effect would support this claim, suggesting that individuals continued exposure to a stimulus (in this case, White actors) would increase their liking of the stimulus in future events (i.e., White actors in future movies). If Whitewashing is preferred by moviegoers due to the mere-exposure effect, we should see that both White and monoracial People of Color audience members prefer White actors in their movies.

The impact of mere-exposure on people's preferences is not new to marketing and media studies. Research has shown that the impact of just exposing oneself repeatedly to a product can increase one's liking for that product, however there are moderating and mediating variables (Bornstein, 1989). For example, Cox and Cox (2002) found that preference for a product may be dependent on the perceived complexity of that product. Simple products or products with perceived simplicity seem to actually decrease one's liking of that product after repeated exposure. Similarly, when it comes to aesthetic preferences mere-exposure, alone, seems to be less effective at predicting one's choices than typicality or common representation (Martindale, Moore, & West, 1988). Provided that White casts are the most simple and typical in Western movies, it may be that the preference for predominantly White casts may be not just a product of mere-exposure, but of simplicity and typicality. However, there is also research suggesting that novelty is an important factor in aesthetic preferences. Hekkert, Snelders, & Wieringen (2003) have shown that both novelty and typicality (con-

ceptually opposing concepts) actually work together to create aesthetic preferences. As long as the novelty does not infringe or negate typical representations of the product or concept, then novel items are preferred. Given these findings, one would think that racially diverse casts would be a preferred cast in many shows and movies as it may provide just enough novelty while not affecting the typicality of racial representation. Yet, we still do not see much racial diversity in casting choices.

Another psychological phenomenon may explain the continued Whitewashing in the film industry and this is Social Identity Theory (Tajfel, 1978). In Social Identity Theory, people's self-esteem is anchored in their social identities and thus positive representation of their social identities is necessary to maintain a positive self-esteem. Considering that racial identity is one of the predominant social categories in which people use to identify (Hewstone, Hantzi, & Johnston, 1991), it should not be unusual to find that people prefer to see their racial group positively portrayed in the movies and media. There is research suggesting that people prefer to watch shows that are inclusive of their own gender (Oliver, 2000; Trepte, 2006) and culture (Zillmann et al., 1995). However, the research concerning in-group racial preference on casting choices is still nascent (Weaver, 2011). Weaver's (2011) studies demonstrated some credence to the argument that people prefer racial ingroup members in lead roles, however, this was only demonstrated for White individuals and other factors like genre of movie and celebrity of actors seemed to impact his findings. Additionally, Weaver (2011) found that colorblindness (Neville, Lilly, Duran, Lee, & Browne, 2000) moderated the findings that Whites were more likely to prefer their racial ingroup in movies. Colorblindness is the endorsement that racial identity and membership have no consequence or impact in one's life; an incidentally ironic cognitive bias considering that such an endorsement is indicative of greater prejudice against people of color (Richeson & Nussbaum, 2004). Supporting the association between colorblindness and prejudice, Weaver (2011) found that Whites with high levels of colorblindness were more likely to prefer movies with White casts than monoracial People of Color casts. Suggesting that Whitewashing may be explained by principles of social identity theory, at least for Whites. However, it is still unclear if monoracial People of Color or minorities have the same preferential bias for their own racial ingroup or, possibly, a preference for White casts.

Some evidence (e.g., Harris, 2016; Jones, 2016) has suggested that monoracial People of Color may actually prefer White casts, as has been argued by many entertainment executives who suggest that stories do not sell well overseas. For example, Marion Edwards, Fox's International TV President stated that diverse shows to not sell well overseas, because they do not reflect the society that those people live in: "These shows [diverse shows] are a reflection of our society, but [they are] not a reflection of all societies." She further states: "We are telling our units that they need to be aware that by creating too much diversity in the leads in their show means… problems having their shows translating to the international market." (Roxborough, 2016). If the level of diversity in a society is having

an effect on the racial preference for actors, then we should be able to find this by sampling people from a diverse environment. If the reasoning that less diverse environments tend to create a preference for Whitewashing or White actors then we should see less preference for White actors in more diverse societies.

3. The Present Study

If Whitewashing is a product of "life reflecting art" we should see support for Zajonc's (1968, 2001) mere-exposure effect, in that both Whites and minorities endorse the casting of primarily White actors in their movies. However, if Whitewashing is a product of "art reflecting life" and social identity theory (Tajfel, 1978) is operating universally for both Whites and minorities when it comes to their preference for movies, then we should see that both Whites and minorities prefer their own ingroups to be cast. Additionally, by conducting this study in a racially diverse area we should be able to test if the preference for Whitewashing is at all impacted by the racial diversity of one's environment. The following study was conducted in order to better understand the operating principles behind Whitewashing from an audience standpoint that encompasses both majority (Whites) and minority audience members.

4. Method

Participants and Procedures

Participants were recruited from online social networks sites and at a university in Hawaii. Hawaii is known for its racial diversity and unlike the rest of the mainland US has no one racial majority (US Census Bureau, 2016). It is important to note that we were not measuring "Hawaiian" racial identity, but only how exposure to a racially diverse environment might affect one's preferences for media with racially diverse casts. Undergraduate psychology students at the university received course credit upon completion of the study, while all other participants received no compensation. The following study was approved by the Hawaii Pacific University Institutional Review Board. There were 228 (Female = 165, Male = 63). The average age of participants was 21.42 years (SD = 5.06). Participants were asked to specify which racial group or groups they identified with. Considering that racial identity of participants is being used as the variable testing social identity theory, it is important to delineate how racial identity was measured. Participants could choose from a variety of racial groups including listing their own racial groups should one not be listed. Those that identified with more than one racial group, were automatically classified as "Multiracial". Those that identified with only one minority (i.e., not White) racial group were automatically classified as Monoracial People of Color (MPOC). The sample reflected a racially diverse population: 38% Multiracial, 32% MPOC (Asian = 46, Hawaiian = 9, Hispanic = 9, and Black = 8), and 30% White.

Each participant completed an online self-report survey via Qualtrics. The

participant filled out basic demographic information: gender, age, and ethnicity. The survey included questions measuring the amount and type of media watched and preferred. Example questions included: "In a typical week, how many hours of TV do you watch?" and "Which sources of entertainment do you use most often?".

After the demographic questions, participants were randomly assigned to one of three conditions: Asian cast, Black cast, or White cast. In each condition, participants were presented with four stories that were pre-selected for familiarity. *Aladdin* was chosen because a previous pre-study revealed that participants saw this film to be equally cast with monoracial People of Color actors. The four stories included: *Aladdin* (Clements & Musker, 1992), *Titanic* (Cameron & Landau, 1997), *Harry Potter* (Rowling, 2001), and *The Little Mermaid* (Clements & Musker, 1989). The participants were given the description of the story, along with a pre-selected cast for each story. Those in the Asian cast condition were shown an Asian cast, those in the Black cast condition were shown a Black cast, and those in the White cast condition were shown a White cast. Actors and actresses were selected from IMDB database and the StarMeter was used to match actor's prominence across racial groups. Although we were able to match several White and Black actors (e.g., Johnny Depp and Will Smith) in concerns with their StarMeter profiles, this proved to be difficult for the Asian cast, as no Asian actors are currently considered as prominent as Johnny Depp or Will Smith. Participants in the Asian cast condition (StarMeter ratings in parentheses as of July 12, 2016) saw the following cast: Young Mermaid: Brenda Song (Top 5000), Sea Witch: Sandra Oh (Top 5000), Princess: Maggie Q. (Top 5000), Street Peddler: John Cho (Top 5000), Young Orphan Boy: Aaron Yoo (N/A), Evil Sorcerer: Daniel Dae Kim (Top 5000), Young Woman: Jamie Chung (Top 500), Poor Artist: Leonardo Nam (N/A). Participants in the Black cast condition saw the following actors: Young Mermaid: Keke Palmer (Top 5000), Sea Witch: Oprah (Top 5000), Princess: Katarina Graham (N/A), Street Peddler: Michael B. Jordan (Top 5000), Young Orphan Boy: Corbin Bleu (Top 5000), Evil Sorcerer: Will Smith (99), Young Woman: Zoe Saldana (Top 500), Poor Artist: Brian White (N/A). Participants in the White cast condition saw this cast: Young Mermaid: Emma Stone (95), Sea Witch: Jennifer Love-Hewitt (Top 500), Princess: Chloe Moretz (32), Street Peddler: Zac Efron (100), Young Orphan Boy: Josh Hutcherson (Top 5000), Evil Sorcerer: Johnny Depp (87), Young Woman: Amanda Seyfried (Top 500), Poor Artist: Liam Hemsworth (85).

Participants reported their willingness to watch the movie and to predict the likelihood of the movies success using a 7-point Likert Scale. For example, the participants were asked, "How likely are you to watch this movie with the chosen cast?" based on a scale from (1) "Very Unlikely" to (7) "Very Likely".

The second part of the study, also called the "participant casted" part of the study, asked participants to cast their own actors and actresses. Participants were given separate stories (again pre-selected for familiarity) and possible actors (pre-selected to be similar in terms of fame) from three different racial groups

(Asian, Black, and White). Participants were told they could cast their own actors and actresses from a possible list of actors and actresses. Additionally, participants saw photos of the actors and actresses (retrieved from IMDB.com). If former exposure to the minority casts (Asian, Black, White) had any impact on their casting choices in this part of the experiment, we would be able to test this and show confirmation or disconfirmation of a mere-exposure effect. The stories presented included *Holes* (Davis et al., 2003), *Mulan* (Murphy et al., 2013), *Robin Hood* (Burrows, Corvino, & Pyle, 2005), *Rumpelstiltskin* (Hunt, 1944), and *The Pursuit of Happyness* (Gardner, 2006). Stories were chosen after a pre-test revealed that these were the most well known stories. We were specifically looking to see if any Whitewashing would appear in the story of *Mulan* and *The Pursuit of Happyness*. The participants were able to cast two actors per story and could choose from Asian, Black, or White actors/actresses; all actors and actresses that were previously presented in the pre-casted portion of the study were available for casting. Participants indicated their happiness with their choice for each story's cast with questions including, "How happy are you with this cast?" and "How likely do you think others will watch this movie considering the cast you have selected?". Participants answered from (1) "Very Unhappy/Unlikely" to (7) "Very Happy/Likely"At the end of the study, participants were debriefed and thanked for their time.

5. Results

5.1. Testing for Preference for Whitewashed casts

To test if participants preferred White and Whitewashed casts for the pre-casted stories, we conducted a 3 × 3 × 2 MANOVA with the first factor being Race of participant (Monoracial monoracial People of Color, Multiracial, and White), the second factor being Condition (Asian cast, Black cast, White cast), the third factor being Media exposure (measured as a median split of hours per week spent watching media), and the dependent variables were likelihood of watching the pre-casted movies. If social identity theory is driving the preference for Whitewashing or White casted shows, we should see a significant interaction of Race and Condition on preference for movie, such that participants will be more likely to say they will watch a movie if they are presented with a cast that is similar to their own race. If the mere-exposure effect is driving the preference for Whitewashing, then we should see a main effect for Media exposure, such that those who score high on Media exposure will be more likely to say they would watch movies that are Whitewashed or with an exclusively White cast.

The main effect for Race of participant was significant for 2 movies: the likelihood of watching the movie *Titanic* ($F(2, 189) = 3.17$, $p = .04$, $\eta^2 = .03$) and the likelihood of watching the movie *The Little Mermaid* ($F(2, 189) = 2.98$, $p = .05$, $\eta^2 = .03$). Post-hoc analysis with Bonferroni adjustment revealed that Multiracial participants were more likely to report wanting to watch *Titanic* ($M = 5.13$, $SE = .22$) and *The Little Mermaid* ($M = 4.95$, $SE = .23$) than their White peers (*Titanic*: $M = 4.34$, $SE = .24$; *Little Mermaid:* $M = 4.13$, $SE = .25$). There was no sig-

nificant difference between Whites and monoracial People of Color or monoracial People of Color and Multiracials in their preference for watching any of the pre-casted movies. With the exception of *Aladdin* ($F(2,189) = 1.52$, $p = .22$, $\eta_p^2 = .02$), all movies (*Titanic:* $F(2,189) = 3.88$, $p = .02$, $\eta_p^2 = .04$) (Harry Potter: $F(2,189) = 4.63$, $p = .01$, $\eta_p^2 = .05$) (*Little Mermaid*: $F(2,189) = 5.39$, $p = .005$, $\eta_p^2 = .05$) were impacted by Condition, or the race of the casted actors. Post-hoc analysis using Bonferroni correction, revealed that Whites were preferred as the cast for stories like *Titanic* ($M = 5.20$, $SE = .22$) and *Harry Potter* ($M = 4.78$, $SE = .23$) over Asian casts (*Titanic:* $M = 4.39$, $SE = .23$; *Harry Potter*: $M = 3.75$, $SE = .25$), however there was no statistically significant difference between White and Black casts for these movies. For the movie *The Little Mermaid,* an Asian cast ($M = 4.99$, $SE = .24$) was preferred over a Black cast ($M = 3.90$, $SE = .24$), but there was no significant difference between Asian or White casts. See Figure 1 for an illustration of differences between the pre-casted movies. Media exposure (low vs high) and the interactions were not statistically significant in predicting any of the dependent variables.

5.2. Testing for Whitewashing in Participant Casting

During the second section of the study, participants could choose to cast their own characters. For the story of *Rumpelstiltskin*, 48% of participants chose a White cast, followed by 36% Multiracial cast and 16% Minority cast. For the story of *Holes*, 46% of participants chose a Minority cast, 32% chose a Multiracial cast, and 22% chose a White cast. For the story of Mulan, 90% chose a Minority cast, 8% chose a Multiracial cast, and 2% chose a White cast. For the story of *Robin Hood*, 56% chose a Multiracial cast, 33% chose a Minority cast, and 11% chose a White cast. For the story of the *Pursuit of Happyness*, 56% chose a Minority cast, 39% chose a Multiracial cast, and 2% chose a White cast.

To test if Whitewashing was preferred for the "participant casted" part of the study, we first calculated the frequency of Asians, Blacks, and Whites casted by

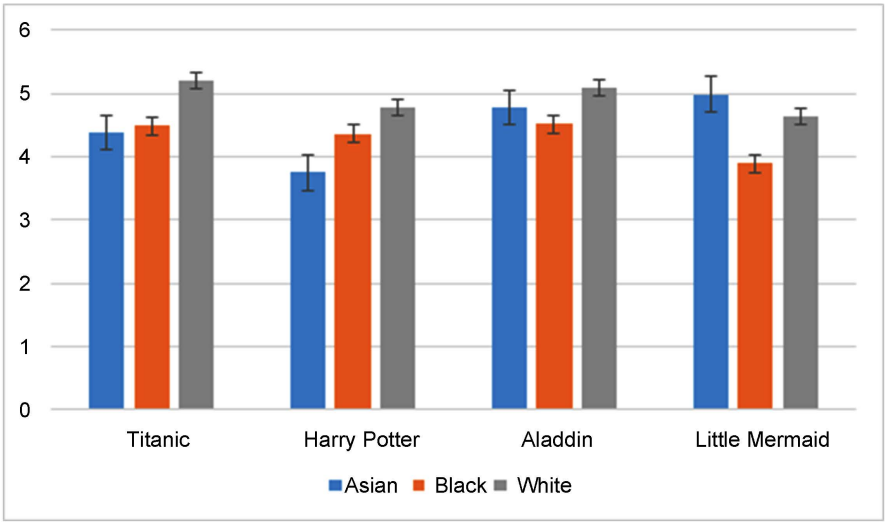

Figure 1. Preference for Asian, Black, or White casts across four different movies.

each participant. We then conducted a 3 × 3 × 2 MANOVA, with race of participant (Multiracial vs monoracial People of Color vs White), Condition of previous study (Asian vs Black vs White cast) and media usage (Low vs High) as the predictors and the frequency of casting an Asian, Black or White actor as the dependent variables. If social identity theory is driving preference for casting or preferring a certain race, then we should see the race of participant as a statistical predictor. If mere-exposure is driving preference for casting or preferring a certain race, we should see Condition and/or media exposure as a statistically significant predictor. Interestingly, the only statistically significant predictor of casting White actors was the interaction of participant race and Condition or the race of the previously casted condition in the beginning of the study ($F(4,162) = 3.42$, $p = .01$, $\eta_p^2 = .08$). Simple slopes tests using the *Process* macro in SPSS revealed that when monoracial People of Color were previously exposed to an Asian cast, they preferred White casts more ($M = 1.38$, $SE = .15$) than their peers who were previously exposed to Black ($M = 0.65$, $SE = .75$) or White ($M = 0.75$, $SE = .17$) casts. None of the other comparisons were significant.

To test if the race of the cast chosen by participants affected how happy they were with the cast and how likely they thought others would see the movie, we conducted a series of MANOVAs, using their happiness with chosen cast and likelihood that others would see the movie as dependent variables. We then used race of the cast as a predictor. Race of the actors chosen by participants was not statistically significant in predicting their happiness with the cast or their belief in the likelihood that others would see the movie (ps > .05).

6. Discussion

Is Whitewashing a product of bias by media executives or audience preference? The main objective of this study was to test if mere-exposure (Zajonc, 1968, 2001), measured as the amount of media exposure participants reported, or social identity theory (Tajfel, 1978) measured as racial identity, could predict the preference for Whitewashing or White actors. Interestingly, our studies findings did not show support for social identity theory, thus audience members are not preferring their own race when watching shows or movies. Participants did not prefer actors of their own race when shown pre-casted shows or when they were able to cast their own shows. However, we did reveal an anti-Asian bias. In the first part of our study, participants preferred shows that presented either White or Black actors over Asian actors. However, this was only true for stories in which the characters are traditionally White: *Harry Potter*, *Titanic*, and the *Little Mermaid*. The story of *Aladdin* showed no preference for race of actor. Considering that *Aladdin* is a traditionally middle eastern folktale, it is not surprising that participants seem to have no racial preference for the actors, since we did not provide any Middle Eastern actors. Given social identity theory and that our sample's monoracial People of Color population was mostly Asian, one might expect that these individuals would have shown a preference for the Asian actors in the pre-casted stories. Instead, all participants, despite their race, had a *rejec-*

tion for Asian actors. Although stories like *Harry Potter*, *Titanic*, and *the Little Mermaid* are traditionally White stories, participants seemed equally likely to watch that story if it was cast with Black actors. Additionally, the mere-exposure effect did not seem to provide a clear rationale for these findings either, as participant's previously reported media exposure was not related to their preference for actors of a certain race.

The second part of the study revealed an even more surprising result when monoracial People of Color participants (who again are mostly Asian), seemed to prefer casting White actors *after* seeing shows with only Asian actors; showing some support for the mere-exposure effect. Interestingly, there was no preference for White actors when monoracial People of Color participants initially saw a Black cast or a White cast in the first part of the study; the preference for White actors by monoracial People of Color was only evident after seeing Asian actors. Some media attention has been given to the idea that Hollywood cannot sell shows with racially diverse casts to overseas markets, specifically Asia and Europe (Harris, 2016; Roxborough, 2016). Marion Edwards, Fox's International TV President, suggested that the lack of profitability in foreign markets may be due to a lack of diversity in these areas (Jones, 2016). However, our sample from Hawaii, is located in a racially diverse area (US Census Bureau, 2016). It appears that neither the racial diversity of an area nor social identity theory seem to be good predictors of an anti-Asian bias. Instead, it seems that mere-exposure; when measured as immediate exposure to actors of Asian descent and not previous time watching popular media (TV and film), may be driving a White preference or anti-Asian bias.

Some possible reasons for why, specifically Asians preferred White actors after viewing Asian actors may be rooted in findings from marketing and relationships research that have revealed a "White bias" for Asians. Specifically, Asian culture emphasizes whiteness and fairness as a form of beauty; skin whitening creams are sold routinely in order to enhance one's attractiveness, especially for women (Li et al., 2008). Additionally, Asian women have a high percentage of interracial dating and those who do date interracially, are more likely to date White men than any other racial group (Mok, 1999). The Asian obsession with Whiteness may be an important element for how Asians see themselves and the entertainment they prefer.

7. Limitations of This Study

This study has several limitations that are important to address in future research. The first limitation was that the stories in the study were mostly known by or a reflection of Western values and thoughts. Although we did specifically choose three Non-Western stories: *Aladdin*, *Mulan*, and *The Pursuit of Happyness* to test for Whitewashing, these stories are still prevalent in Western culture and participants may have been influenced by previous media exposure.

Future research should consider measuring participants' cultural values and admiration for White culture. Although Weaver (2011) found that colorblind-

ness was related to White preference of actors, colorblindness is positively related to prejudice and is not necessarily related to White admiration. White admiration or valuing of Whiteness may be an important element when considering the preference of White actors, especially by monoracial People of Color audience members.

Finally, this study is the only study that we know that addresses both majority and minority racial preference for actors. Most studies on diversity are concerned with the impact diversity has on White individuals (see Rattan & Ambady, 2013, for a review), however, considering the growing diversity of the US (Colby & Ortman, 2014) and current rates of globalization, future research needs to consider and investigate how minorities are impacted by the growth in diversity and their representation in the media.

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Best Practice Recommendations for Using Structural Equation Modelling in Psychological Research

Todd G. Morrison*, Melanie A. Morrison, Jessica M. McCutcheon

Department of Psychology, University of Saskatchewan, Saskatoon, Canada
Email: *Todd.Morrison@usask.ca

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Abstract

Although structural equation modelling (SEM) is a popular analytic technique in the social sciences, it remains subject to misuse. The purposes of this paper are to assist psychologists interested in using SEM by: 1) providing a brief overview of this method; and 2) describing best practice recommendations for testing models and reporting findings. We also outline several resources that psychologists with limited familiarity about SEM may find helpful.

Keywords

Structural Equation Modelling, Guidelines, Statistics, Primer

1. Introduction

By now, many psychologists will have encountered peer-reviewed papers in psychology and other disciplines that feature structural equation modelling (SEM). However, if you have not yet come across a paper that uses SEM or have heard reference to this statistical technique only in passing, you may be left with the following questions: What is SEM? Why does one use SEM? and What are SEM's key definitions and concepts? In our paper, we address these questions. We begin by providing a concise conceptual overview of SEM: its purpose, utility, and essential features, the latter through a diagrammatic representation of a mediational model. Identified next are criteria researchers should satisfy when using SEM as a statistical technique. We then close by highlighting various supplemental resources that may prove helpful to both novice and seasoned practitioners of SEM. Though there are certainly primers available on SEM, and excellent ones at that, we generated this contemporary, accessible, and interdisciplinary overview as a means of consolidating the most up-to-date recommenda-

tions possible in one place and, consequently, look to fuel new understanding and ongoing appropriate use of SEM as a data analytic method for the psychological community.

1.1. What Is Structural Equation Modelling?

SEM has been around for the past 60 years, but has increased significantly in popularity over the course of the last three decades (Von der Embse, 2016). SEM is a multivariate statistical technique that can be conceptualized as an extension of regression and, more aptly, a hybrid of factor analysis and path analysis (Weston & Gore, 2006). Though it is a complex method of data analysis, the beauty of SEM is that it allows a researcher to analyse the interrelationships among variables (akin to a factor analytic approach) and test hypothesized relationships among constructs (akin to a path analytic approach). Von der Embse (2016) further emphasizes that SEM enables testing of hypothesized relationships that are not possible with traditional data analytic methods. For instance, when using regression analyses, one must take a "step-by-step" approach to test interrelationships. With SEM, users are permitted to test a number of interrelationships simultaneously.

Since SEM often assumes linear relationships, it is similar to common statistical techniques such as analysis of variance (ANOVA), multivariate analysis of variance (MANOVA), and multiple regression; yet, where SEM departs from the aforementioned is in its capacity to estimate and test complex patterns of relationships at the construct level. Weston & Gore (2006: p. 723) emphasize that, "unlike other general linear models, where constructs are represented by only one measure and measurement error is not modeled, SEM allows a researcher to use multiple measures to represent constructs and addresses the issue of measure-specific error." According to these authors, it is this difference that allows one to test the construct validity of factors. With respect to measurement-specific error (i.e., error produced via multiple raters, administrations, or test variations), the measurement error that typically accompanies each observed variable is taken into account and appears in the form of measurement error variables. Thus, conclusions researchers may draw about relationships between constructs when using SEM are not biased by measurement error, as these relationships "are equivalent to relationships between variables of perfect reliability" (Werner & Schermelleh-Engel, 2009, p. 1). In all, SEM departs from other statistical methods because it enables researchers to include multiple measures and reduce their measurement error—error inherent in any data utilized in the social sciences or related disciplines.

When testing the interrelationships among variables and constructs, as one does with SEM, researchers should be aware that they are, in essence, taking a confirmatory (i.e., hypothesis-testing) approach rather than an exploratory approach to their data analysis (Byrne, 2016). A confirmatory approach is adopted because researchers specify *a priori* the interrelationships that are theorized to exist (i.e., through specification of a model), with the next step being to test how

well the theorized model fits the obtained (sample) data. Confirmation of fit in this instance can be assessed at a global level (i.e., the theoretical model does or does not fit the data), local level (i.e., the model reproduces or does not reproduce hypothesized relationships between specific variables), and an exploratory level (i.e., determining which aspects of the model require improvement; Von der Embse, 2016).

1.2. What are Essential Features of Structural Equation Modelling?

A structural equation (SE) model is a complex amalgam of hypothesized interrelationships represented and tested with equations (Von der Embse, 2016). Specifically, SEM includes, describes, and tests the interrelationships between two types of variables: manifest and latent. *Manifest* variables are those that can be directly observed (measured); alternatively, *latent* variables are those that cannot be observed (measured) directly due to their abstract nature (Byrne, 2016; Xiong, Skitmore, & Xia, 2015). Latent variables can be further broken down into *exogenous* and *endogenous* variables. According to Byrne (2016), exogenous latent variables are analogous to independent variables in that they are thought to "cause" fluctuations in the values of other latent variables in the model. Importantly, exogenous variables are not explained by the SE model, but rather can be viewed as factors external to the model that create changes in the value of exogenous variables (Byrne, 2016). Variables such as gender and socioeconomic status may be factors external to a SE model and may produce fluctuations in other latent variables. Endogenous variables, on the other hand, are synonymous with dependent variables. Endogenous latent variables are influenced by exogenous latent variables and this influence can occur directly or indirectly. Since all latent variables influencing endogenous variables are specified within a SE model, any change in the value of endogenous latent variables is thought to be explained by the model (Byrne, 2016; Winke, 2014).

A SE model typically consists of a *measurement model*, which is a set of observed variables that represent a small number of latent (unobserved) variables. The measurement model describes the relationship between observed variables (e.g., instruments) and unobserved variables; that is, it connects the instruments that are used to the constructs they are hypothesized to measure (Byrne, 2016; Weston & Gore, 2006). Confirmatory factor analysis (CFA) would then be employed as a means of determining the pattern of loadings of each newly emerging hypothesized factor. A SE model also typically consists of a *structural model*, which is a schematic depicting the interrelationships among latent variables (Von der Embse, 2016). When the measurement and structural models are considered together, the model is called the full or complete structural model (Weston & Gore, 2006). The complete structural model allows researchers to specify regression structures among the latent variables, wherein "a structural model that specifies direction of cause from one direction only is called a *recursive model*, and one that allows for reciprocal or feedback effects is termed a *nonre-*

cursive model" (Byrne, 2016, p. 7).

Figure 1 depicts an example of a measurement model. In this model, each of the three latent variables—sexual disgust, dehumanization, and modern homonegativity—are symbolized by ellipses (ovals). The observed or manifest variables, referred to as *indicators* here, appear in rectangles. Sexual disgust has seven observed (measured) variables (SD1-SD7; Tybur, Lieberman, & Griskevicius, 2009), dehumanization has eight observed (measured) variables (DEH1-DEH8; Bastian, Denson, & Haslam, 2013), and modern homonegativity has 12 observed (measured) variables (MHS1-MHS12; Morrison & Morrison, 2003). For practical purposes, only one measure hypothesized to represent each latent variable is shown; but, ideally, there would be several measures indicated for each latent variable (Weston & Gore, 2006). Of note, too, is that each manifest variable (each individually observed item in this case) has its own error term (Byrne, 2016). As Weston and Gore (2006) state, measures that are reliable and have fewer errors will be "better indicators of their respective latent variable, much as the items in a scale that most accurately represent the underlying construct have the highest factor loadings in a factor analysis" (p. 726).

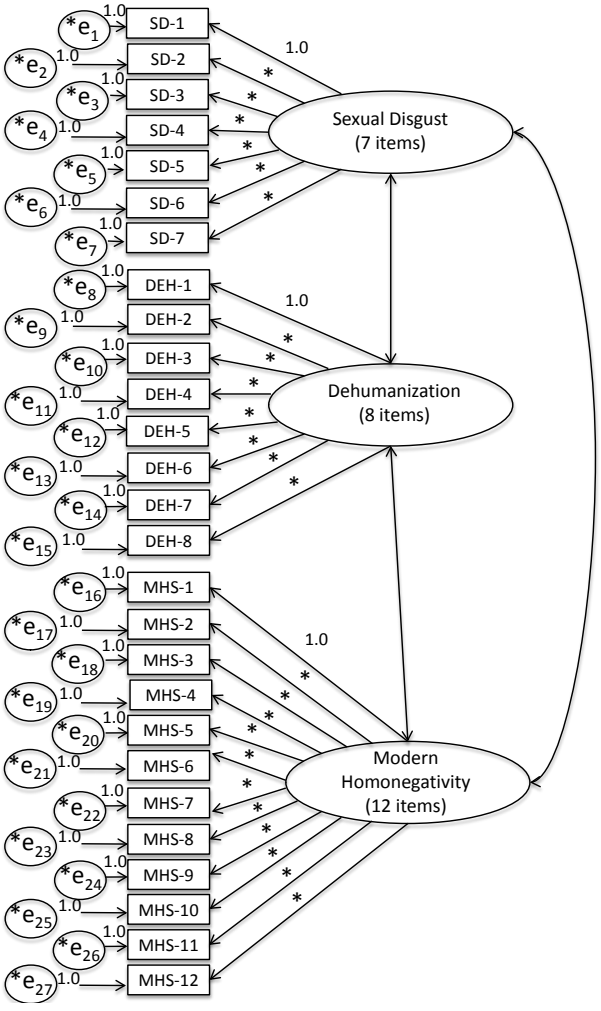

Figure 1. Confirmatory factor analysis used to test measurement model.

Figure 2 provides a schematic of a fully mediated complete model. In this model, it is hypothesized that dehumanization mediates the effects of sexual disgust on modern homonegativity (i.e., negative beliefs about gay men). Specifically, greater levels of sexual disgust are associated with greater levels of dehumanization which, in turn, is associated with greater levels of homonegativity toward gay men. The interrelationships amongst latent variables can be conceptualized as covariances, direct effects, or indirect (mediated) effects. Covariances are similar to correlations, and, if present, would be symbolized in Figure 2 with double-headed arrows. Double-headed arrows in any SE model signify the presence of non-directional relationships (covariances) between latent variables. As there were no double-headed arrows appearing in Figure 2, non-directional relationships were not expected. Figure 2 does, however, indicate the presence of hypothesized direct relationships between sexual disgust and dehumanization, and dehumanization and modern homonegativity. These direct effects are symbolized by single-headed arrows. As Weston and Gore (2006) point out, though directional claims are being made regarding the interrelationships amongst latent variables, the relationships themselves are not causal. Interpreting the strength of the relationships should be carried out much akin to the way one would interpret regression weights. Also in Figure 2, each latent construct is represented by a series of observed indicator variables, each with its own error term (i.e., *e, in the present schematic). The error term for the latent variables is referred to as disturbance and is symbolized with a *D* (*D** in the Figure). Finally, regarding the delineation of exogenous and endogenous variables, of the three latent variables pictured, only sexual disgust is independent (i.e., not predicted by any other latent variable). Dehumanization and modern homonegativity are

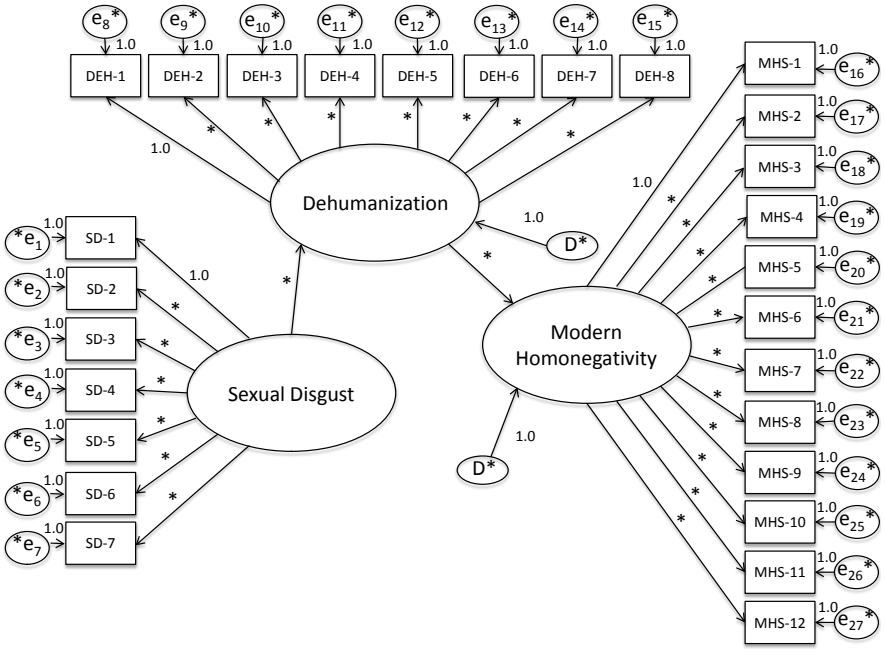

Figure 2. Fully mediated complete model. *Note*: Asterisks represent parameters to be estimated.

endogenous because they are dependent on (i.e., predicted by) their respective latent variables. Given that key concepts related to SEM have been described, we now provide an overview of the practices that researchers are encouraged to employ when using SEM.

2. Best Practices before Testing a Model

2.1. Model Development

When formulating a model, a critical issue pertains to the number of manifest indicators that one should have for each latent variable. The consensus is that ≥ 2 indicators per latent variable is required. In terms of an upper limit, however, no consistent recommendation emerges. Ping (2008) notes an apparent ceiling of six indicators per latent variable due to "extensive item weeding" that may be attributable, in part, to "persistent model-to-data fit difficulties" (p. 2). Our recommendation is that one take into consideration the sometimes competing interests of parsimony and model thoroughness. Finally, with respect to manifest indicators, Ho's (2013) advice is sound: "researchers should be guided by the axiom that it is preferable to employ a relatively small number of good indicators than to delude oneself with a relatively large number of poor ones" (p. 432). It is essential that measures selected to represent latent variables be psychometrically robust. Of particular importance are the matters of content validity, scale score reliability, and construct validity.

Content validity may be defined as the relevance and representativeness of the targeted construct, across all features of a measure (e.g., the scale items and the instructions provided to respondents: Haynes, Richard, & Kubany, 1995). This type of validity may be established in the following ways: a) conducting an extensive review of the literature pertinent to the construct (including published and unpublished work); b) consulting with stakeholders from relevant groups that are able to furnish valuable insights about the construct; and c) using experts to gauge the suitability of all items designed to measure the construct (Yaghmaie, 2009). If there are insufficient details about an instrument's content validity, then we recommend researchers opt for another measure.

In terms of scale score reliability, the most popular estimate is Cronbach's alpha, which is the "expected correlation between an actual test and a hypothetical alternative form of the same length" (Carmines & Zeller, 1979: p. 45). As reliability is a product of scale scores, it must be calculated whenever a researcher intends to average or sum a multi-item measure (Streiner, 2003). A Cronbach's alpha coefficient of .80 often serves as the cut-off for "good" reliability, with Streiner (2003) advocating a maximum value of .90. (Values exceeding .90 suggest item redundancy.) However, we do not advise rigid adherence to cut-off values, as there may be instances were low alpha coefficients are defensible (see Johns & Holden, 1997; Schmitt, 1996).

It should be noted that Cronbach's alpha has been subject to considerable criticism and that other forms of scale score reliability have been recommended such as Omega (e.g., Dunn, Baguley, & Brunsden, 2014). For example, Peters

(2014) notes that Cronbach's alpha uses the essentially tau-equivalent model which operates in accordance with a specific set of assumptions; ones that are seldom met with real-world psychological data. These assumptions include: 1) all items measure the same underlying variable; 2) all items are of comparable strength in terms of their association with that underlying variable; 3) unidimensionality; and 3) item variances and covariances are equal (Peters, 2014). For these reasons, we, subsequently, describe other indicators of reliability that practitioners of SEM may wish to test.

Carmines and Zeller (1979) note that there are two principal forms of construct validity: convergent and discriminant. Convergent validity examines whether scores on the measure that is being validated correlate with other variables with which, for theoretical and/or empirical reasons, they should be correlated. Discriminant validity, on the other hand, targets variables that, again for theoretical and/or empirical reasons, should have a negligible association with the measure being validated (Springer, Abell, & Hudson, 2002).

Testing a measure's psychometric soundness is an iterative process that necessitates the accumulation of multiple strands of validation across diverse samples. We recommend that, when targeting measures for inclusion in a model that will be tested with SEM, researchers review source articles that detail the precise steps used to create and refine a scale's items as well as the tests conducted to evaluate scale score reliability and validity. Finally, it is vital to emphasize that utilizing instruments that seem to be psychometrically robust does not preclude assessing the reliability and validity of the measurement models (i.e., the confirmatory factor components of a SE model). We review these topics later in the document.

2.2. Alternative Models

It is important to acknowledge *a priori* the existence of models that are rivals to the one being tested (Weston & Gore, 2006). Such rivals may reflect "other theoretical propositions and/or contradictions in empirical findings" (Nunkoo, Ramkissoon, & Gursoy, 2013: p. 761) and should be made explicit and tested.

2.3. Sample Size Requirements

The issue of how many participants are needed to use SEM as an analytic technique remains a point of contention (see, for example, Barrett, 2007; Iacobucci, 2010). However, rules-of-thumb do not appear to be appropriate as issues such as model complexity, amount of missing data, and size of factor loadings have implications for the numbers of participants required (Wolf, Harrington, Clark, & Miller, 2013). Using Monte Carlo simulation, Wolf et al. found that if a researcher wanted to conduct a confirmatory factor analysis with a single latent variable and 6 indicators (having average loadings of .65), a sample size of 60 was adequate. However, for a more complex mediation model, consisting of three latent factors (each having three manifest indicators), the minimum sample needed was 180. To assist with sample size decision-making, an *a priori* sam-

ple size calculator may be helpful (see, for example: http://www.danielsoper.com/statcalc/calculator.aspx?id=89). With this calculator, individuals must provide the anticipated effect size (typically .1 to .3), the desired level of statistical power (usually set at .80), the number of latent variables included in the model, the number of manifest indicators (i.e., measured variables), and the probability value used to denote "statistical significance" (traditionally .05).

3. Best Practices When Testing Models

3.1. Data-Related Assumptions

The most commonly used estimation method in SEM is maximum-likelihood (ML). ML has various assumptions including: 1) there will be no missing data; and 2) the endogenous (or dependent) variables will have a multivariate normal distribution.

If a complete datafile is unavailable, then the researcher must test whether the data are missing completely at random (MCAR), missing at random (MAR), or missing not at random (MNAR). If data are MCAR, then the "missingness" on the variable of interest is unrelated to any of the variables in the dataset. If the data are MAR, then systematic differences may exist between missing and observed values; however, these differences are accounted for by *other* variables in the dataset (Bhaskaran & Smeeth, 2014). Finally, if data are MNAR, then there is a systematic pattern to the missing data (the presence or absence of a score on variable X is related to the variable itself). To determine whether data are MCAR, Little's MCAR test can be used (i.e., a statistically non-significant p value [>.05] denotes that data are MCAR). If Little's test is statistically significant, then data may be MAR or MNAR; further investigation of participants with missing data is required. If data are MCAR or MAR, the sample is large, and the proportion of missing data is modest (< 5%), listwise deletion is a reasonable option (Green, 2016). An alternative approach is using Multiple Imputation (MI) to estimate missing data. Finally, when data are MNAR, item parcels may be useful (see Orcan, 2013); though for the novice practitioner, SEM would not be recommended (Allison, 2003).

Having data that are multivariate normal is a key assumption when performing SEM (using the ML default). Although univariate normality does not guarantee the multivariate normality of one's data, we recommend that each variable be scrutinized to identify any deviations from a normal distribution. Ghasemi and Zahediasl (2012) provide a straightforward overview of the primary visual and statistical techniques that may be used to gauge univariate normality. The two key considerations are skew and kurtosis. Skewness refers to the *lack* of symmetry in the distribution of one's data (i.e., for a symmetrical distribution, or one without skew, the distribution to the left or right of the center-point looks identical: Field, 2013). Kurtosis may be thought of as the "tail-heaviness" of the distribution of one's data (i.e., leptokurtosis happens when the number and extremity of outliers is smaller than would occur with a normal distribution; pla-

tykurtosis occurs when the number and extremity of outliers is greater than would take place with a normal distribution). Suggested cut-offs for the skewness index (i.e., skew divided by the standard error of skew) and the kurtosis index (i.e., kurtosis divided by the standard error of kurtosis) are absolute values greater than 3 and 10, respectively (Weston & Gore, 2006). Determining multivariate normality is more difficult, as popular statistical packages such as SPSS do not offer formal tests of multivariate skewness and kurtosis. However, Wan Nor (2015) offers a step-by-step guide to graphically assessing multivariate normality using SPSS and DeCarlo provides SPSS syntax that may be used to determine both univariate and multivariate normality (see: http://www.columbia.edu/~ld208/). If data are non-normal, they may be transformed. Tabachnick and Fidell (2006) provide SPSS and SAS compute commands to address issues of moderate to severe positive and negative skew (see page 89). Another option is to assess model fit using a *p* value that is not ML-based (e.g., Bollen-Stine in AMOS).

3.2. Two-Stage Modelling

When conducting SEM, it is recommended that the measurement models be assessed first, using confirmatory factor analysis (CFA), followed by simultaneous assessment of the measurement and structural models (Anderson & Gerbing, 1988). As noted earlier, each measurement model consists of at least one latent factor, its measured indicators and their associated error terms. The structural model represents the predicted associations among the latent variables based on theory and/or prior empirical research (Xiang et al., 2015). Thus, a model containing two latent variables (Y1 and Y2), each of which is represented by three manifest indicators (Y1: x1, x2, x3; Y2: x1, x2, x3) would consist of two measurement models (one for Y1 and one for Y2) and one structural model that tests Y1 and Y2 simultaneously. With the two-stage approach, each measurement model is tested. If adequate fit is not obtained, then each model may be subject to re-specification, provided one can justify doing so on the basis of theory, indicator content, and/or past research (Anderson & Gerbing, 1988). It should be noted that, unless a compelling reason is specified *a priori*, simply correlating error terms to improve fit is not recommended because doing so takes "advantage of chance, at a cost of only a single degree of freedom, with a consequent loss of interpretability and theoretical meaningfulness" (Anderson & Gerbing, 1988: p. 417). The structural model then is evaluated.

3.3. Reliability and Validity

When testing each measurement model, using confirmatory factor analysis, output can be used to assess indicator and composite reliabilities as well as convergent and discriminant validities. Indicator reliability (IR) refers to the proportion of variance in each measured variable that is accounted for by the latent factor it supposedly represents (O'Rourke & Hatcher, 2013). Calculating IR is straightforward as it merely involves squaring the standardized factor loading

for each measured variable (O'Rourke & Hatcher, 2013). Thus, if latent variable Y had three indicators (x1, x2, and x3) with factor loadings of .54, .67, and .80, respectively, IR coefficients would be .29 ($.54^2$), .45 ($.67^2$), and .64 ($.80^2$). Note that the IR values for x1 and x2 are low and may warrant scrutiny. Composite reliability (CR), which may be viewed as analogous to Cronbach's alpha coefficient, also should be computed for each latent factor. The following steps may be used to compute CR: a) calculate IR for each item (i.e., each factor loading squared); b) determine the error variance for each item by subtracting each IR value from 1 (i.e., 1-IR); c) for a given latent variable, sum the standardized factor loadings and then square the sum; and d) for a given latent variable, take the squared sum of the factor loadings (ΣSSL) and divide that number by itself (ΣSSL) plus the sum of the error variance (ΣEV); that is: ΣSSL/ΣSSL + ΣEV. The resultant value denotes the CR for the latent variable in question. Using the hypothetical values listed above (i.e., IRs for x1, x2, and x3 = .29, .45, and .64, respectively), the error variances are: 1 - .29 = .71 for x1; 1 - .45 = .55 for x2; and 1 - .64 = .36 for x3. As noted earlier, the factor loadings were .54, .67, and .80. The sum of these values squared is 4.04 (i.e., .54 + .67 + .80 = = 2.01^2). The sum of the error variances is 1.62 (i.e., .71 + .55 + .36). Thus, the resultant CR for latent variable Y is .71 (i.e., 4.04/4.04 + 1.62). As values of .70+ are considered to be acceptable in research that is not strictly exploratory (Nunkoo et al., 2015), this hypothetical CR value is satisfactory.

The average variance extracted (AVE) may be used to test the convergent validity of the measurement model. To compute AVE for a given latent variable, simply square each standardized factor loading, sum them, and divide by the total number of loadings. Using the aforementioned hypothetical loadings (.54, .67, and .80), the squared sum is 1.38 ($.54^2$ + $.67^2$ + $.80^2$); dividing that total by 3 (number of loadings), the AVE is .46. This value is below the typical cut-off used to establish convergent validity (.50+; Nunkoo et al., 2015). Provided that one has no more than 10 measured indicators per latent factor, the following online calculator may be useful when wishing to determine AVE: http://www.watoowatoo.net/sem/sem.html. This calculator also provides composite reliability coefficients (see: Jöreskog's rho).

Finally, to assess discriminant validity, the procedure outlined by Fornell & Larcker (1981) appears to be reasonable. Using latent variables Y_1 and Y_2 as hypothetical examples, the researcher would first calculate AVE values for the two variables and then contrast these values with the squared correlation between Y_1 and Y_2. If *both* AVE numbers are greater than the square of the correlation, discriminant validity has been demonstrated.

3.4. Model Fit

A broad range of fit indices, encompassing four broad categories (i.e., overall model fit, incremental fit, absolute fit, and predictive fit), should be used (Worthington & Whittaker, 2006). Overall model fit, which includes the chi-square

test, tests precisely what it describes: whether the model fits the observed data. Ropovik (2015) notes that, while a statistically significant chi-square value is often ignored on the grounds that the test itself is overly sensitive when large samples are used, the "only message that a significant χ^2 tells is… take a good look at that model [as] something may be wrong here" (p. 4). Further, the attainment of fit using other indices (e.g., GFI or RMSEA) does not necessarily mean that the chi-square test was statistically significant because of a trivial misspecification. Detailed analysis of the model is required.

Incremental fit indices compare the model that is being tested to a baseline model which, typically, is one in which all variables are uncorrelated (Worthington & Whittaker, 2006). Sample indices include: the normed fit index (NFI), the comparative fit index (CFI), and the Tucker Lewis index (TLI). Absolute fit indices, such as the root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and the standardized root mean square residual (SRMR), determine how well a model specified *a priori* reproduces the sample data (Hooper, Coughlan, & Mullen, 2008). If the SRMR is not reported, then we recommend researchers furnish a table of correlation residuals, which represent the difference between a correlation for the model and an observed correlation. The greater the absolute magnitude of a given correlation residual, the greater the misfit between the model and the actual data for the two variables in question.

With respect to cut-off values for various fit indices, the current perspective is that individuals should avoid mindlessly using cut-off values and that "no single cut-off value for any particular [fit index] can be broadly applied across latent variable models" (McNeish, An, & Hancock, 2017: p. 8). Measurement quality, which McNeish et al. operationalize as the magnitude of the standardized loadings between each latent construct and its manifest variables, plays a critical role with respect to the interpretability of cut-off values. Referring to the reliability paradox, these researchers note that fit indices tend to be worse when measurement quality is higher rather than lower. Thus, a model with standardized loadings of .90 may produce worse fit statistics than a model with standardized loadings of .40—although the former has better data-model fit than does the latter.

Finally, predictive fit indicators examine "how well the structural equation model would fit other samples from the same population" (Worthington & Whittaker, 2006: p. 828). One common example is the Akaike Information Criterion (AIC), which measures "badness" of fit (i.e., the model with the *lowest* AIC value is the most parsimonious and, thus, would be chosen: Schermelleh-Engel, Moosbrugger, & Müller, 2003).

4. Reporting Guidelines for SEM

When writing a manuscript that involves SEM, various pieces of information are essential if readers are to make an informed decision about the appropriateness of the findings. We recommend the following be reported:

1. As determined by an *a priori* power analysis, the minimum number of participants needed, given the models that are being tested.

2. At least one alternative model that is plausible in light of extant theory or relevant empirical findings.
3. Graphical displays of all measurement and structural models.
4. Brief details about the psychometric properties of scale scores for all measured variables (e.g., Cronbach's alpha and its 95% confidence intervals or, preferably, omega as well as 2 to 3 sentences per measure detailing evidence of content and construct validities).
5. The proportion of data that are missing and whether missing data are MCAR, MAR, or MNAR. As well, researchers should explicate how this decision was reached (e.g., why does a researcher assume missing data are MAR?), and the action taken to address missing data.
6. Assessments of univariate and multivariate normality for all measured indicators.
7. The estimation method used to generate all SEMs (default is ML estimation).
8. The software (including version) that was used to analyze the data.
9. In accordance with the advised two-step approach, full CFA details about each measurement model followed by complete SEM details about the structural model.
10. Indicator and composite reliabilities.
11. Average variance extracted (AVE) for each latent factor which denote convergent validity.
12. Discriminant validity of latent factors, as per Fornell and Larcker's (1981) test.
13. All standardized loadings from latent variables to manifest variables (reflective models).
14. Fit indices that reflect overall, absolute, and incremental fit. If applicable, predictive fit indicators should be included.
15. A clear and compelling rationale for all post-hoc model modifications.
16. An indicator of effect size for the final model.

5. Useful Resources

We would like to conclude this brief primer by listing resources that we recommend both novice and experienced practitioners of SEM consult.

1. Byrne, B. M. (2016). *Structural equation modelling with AMOS: Basic concepts, applications, and programming* (3rd ed.). New York: Routledge.

The popularity of AMOS software for SEM analysis makes Byrne's (2016) book a valuable resource for many SEM users. Byrne provides an easy-to-understand introduction to SEM and AMOS, not requiring the reader to have any pre-existing knowledge about SEM or any software programs. She includes detailed instructions on calculating reliability and validity (a best practice that has largely been ignored by researchers), drop-down menus, charts, and tables directly from AMOS, which allows the reader to follow along without any difficulty. Moreover, the data that are used in the examples are available to the readers online, allowing them to fully ensure they can conduct SEM using AMOS before

they try with their own data.

2. Gaskin, J. [James Gaskin]. (2014, May 8). *SEM BootCamp 2014 Series* [Video Files]. Retrieved from https://www.youtube.com/watch?v=C_Jf4l0PFl8

Dr. James Gaskin, from Brigham Young University, offers a YouTube series, titled "SEM BootCamp," that takes the viewers through best practices for conducting SEM using AMOS. Topics include, but are not limited to, data screening, assumption testing, mediation and moderation, and potential issues that might be encountered. The videos provide a user-friendly and step-by-step guide, emphasizing both theory and practice that would be very helpful to those who are novices in SEM. Additionally, viewers are able to access the data files he uses in his examples, allowing them to follow along through the guided examples.

3. Researchgate.net

This website facilitates communication from academics across the globe and, thus, provides an invaluable source of information about all facets of SEM. All one needs to do is "Google" a specific question and, in conjunction with the word "researchgate," a discussion containing relevant information and resources will emerge. For example, using the search terms "multivariate normality," "SEM," and "researchgate" produced 4,650 results (as of February 26, 2017). These hits included discussions about what steps should be taken to test for multivariate normality; what can be done if this assumption is violated; and whether specific software were better suited to address non-normality.

4. O'Rourke & Hatcher (2013). *A step-by-step approach to using SAS for factor analysis and structural equation modelling*. SAS Institute.

Even for non-SAS practitioners, this book offers an accessible overview of SEM by using straightforward language and clear examples. For instance, the authors provide an illustrated, step-by-step guide for computing indicator and composite reliabilities as well as convergent and discriminant validities for latent factors.

5. Winke (2014). Testing hypotheses about language learning using structural equation modelling. *Annual Review of Applied Linguistics, 34*, 102-122.

Dr. Paula Winke has written a paper that provides an excellent introduction to SEM for the novice user. Winke provides examples from applied linguistics that a researcher can understand, and she has a keen ability to describe SEM in a very clear manner. Her overview of what is contained in SEM models (both measurement and structural) are accessible and manage to inspire the reader rather than discourage.

6. Conclusion

SEM is a powerful statistical technique; one that permits assessing "latent variables at the observation level (i.e., a measurement model) and testing hypothesized relationships between latent variables at the theoretical level (i.e., a structural model)" (Nunkoo et al., 2013: p. 759). However, like any statistical procedure, SEM can be subject to inappropriate and indiscriminant use. To maximize

its value in psychological research, it is essential that psychologists should be informed practitioners of SEM. By outlining best practice recommendations that should be followed both prior to, and during, model testing as well as elucidating supplemental resources about SEM that we have found to be valuable, we hope this paper will encourage improved use of this analytic technique.

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Why Do Students Who Are Eligible to Enter University Fall into Academic Probation and What Possibilities Are There for Effective Interventions?

Salim Atay[1,2], Jean-Jacques Ruppert[3,4], Neşe Gülmez[1], Banu Çırakoğlu[2], Hakan Kılıç[1]

[1]Istanbul Technical University, Istanbul, Turkey
[2]Career and Talent Management Association, Istanbul, Turkey
[3]University of Applied Labour Studies of the Federal Employment Agency (HdBA), Mannheim, Germany
[4]Applied Vocational Psychology and Policy Research Unit (AVOPP), Esch-sur-Alzette, Luxembourg
Email: jean-jacques.ruppert@education.lu

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Abstract

Probation is the academic status of students who do not meet minimum academic criteria of Grade Point Average (GPA) as specified by the university. Probation furthermore restricts the amount of credits that can be loaded. It is a growing problem with many different causes. It has been studied for many years with e.g. The Student Adaptation to College Questionnaire (SACQ) consists of four subscales that are social adjustment, personal-emotional adjustment, academic adjustment and institutional attachment (Gerdes & Mallinckrodt, 1994). In 2014, Istanbul Technical University (ITU) Dean of Student and Registrar's Office published the General Statistical Evaluation Report highlighting the issue of academic probation. In this study the authors aimed to identify the reasons of academic probation and to set up an intervention model at the University Career Centre. For this purpose, semi-structured interviews and group discussions were conducted with 182 undergraduate academic probation students from 13 faculties. Data analysis using Qualitative Data Analysis Software (MAXQDA) was used to identify the reasons for academic probation. Once the reasons had been identified, existing tools were improved and new tools were developed. After the implementation of various intervention measures such as promoting career summits, setting up a web portal, informing the administration of the university of the importance and necessity of creating open areas, the results were analysed. At the end of a two-year period of strenuous efforts, the effectiveness of those measures was evident as the probation rate had dropped from 23.46% to 17.08% (ITU Dean of Student and Registrar's Office, 2014, 2016).

Keywords

Academic Probation, Career Centre, Counselling

1. Introduction

Academic probation is the academic status of students who do not meet minimum academic standards and it is widely used by many universities (Lindo, Sanders, & Oreopoulos, 2010). Students fall into academic probation if their GPA does not meet those requirements. It is a common issue for many HE institutions that has been investigated by various authors who aimed at reaching a greater understanding of the causes of academic failure (Pantages & Creedon, 1978; Astin, 1984; Pritchard & Wilson, 2003).

High school graduates are faced with the necessity of adjustment to a new life as soon as they enter university (Shim & Ryan, 2012) as they must adapt to a new environment and its demands. A sizeable number of students are worried about their ability to cope with the new situation and if they fail to overcome this issue and do not find ways to adjust, they may end up no longer paying any attention to their GPA and decide to leave university. Aspelmeier, Love, McGill, Elliott, and Pierce (2012) observed that there is a relationship between college adaptation and GPA and therefore it is important to create environments that facilitate students' involvement.

Academic adjustment has been investigated most frequently. Baker and Siryk (as cited in Gerdes & Mallinckrodt, 1994) indicated that a well-defined goal, a strong attachment to the institution, and a high motivation to learn are also elements of academic adjustment. Furthermore, psychological variables such as personal or emotional problems, anxiety, and low self-esteem have an influence on academic achievement (Gerdes & Mallinckrodt, 1994; Pritchard & Wilson, 2003).

Boyer and Sedlacek (1988) indicated that social support also predicts GPA. Gray, Vitak, Easton and Ellison (2013) found that a strong sense of integration is an important element for future academic success. Being well integrated into social life at college, having a supportive network and good relationships with staff are important components of social adjustment (Gerdes & Mallinckrodt, 1994). Finally, Astin (1984) argued that holding a part-time on-campus job influences retention in a positive way while off-campus jobs have adverse effects on retention.

ITU is one of the best universities in Turkey (QS Top Universities, 2015) and one of the oldest (ITU: From Past to Future, n.d.) and most prestigious in the world. Competition is fierce and prospective ITU students need to get very high marks in the university entrance exam. Nonetheless, the General Statistical Evaluation Report that was prepared by ITU Dean of Student and Registrar's Office observed that almost a quarter of all undergraduates were at one point in

time placed on academic probation. This is the reason why the University's Career Centre conducted this research to identify those factors that lead to the failure of undergraduates who had performed outstandingly well in the ITU admission exams and, ideally, also to develop effective intervention tools. This study was carried out with undergraduates who had been placed on probation because of their poor academic performance. It is hypothesised that poor adjustment to university life has a negative effect on students, leading into academic probation as students who have difficulties adapting to Higher Education will also get lower grades. It is also anticipated that academic probation might be reduced through specific interventions.

2. Method

2.1. Participants

650 undergraduates on probation were invited for an interview via e-mail. 182 students from 13 faculties volunteered to participate in the study. There were 158 male students and 24 female students with an average age of 21.5. Finally, the average of their GPAs was 1.49.

2.2. Measures & Procedure

We used a semi-structured interview technique. There were one-on-one interviews as well as group discussions. SACQ constituted the base for our questions. SACQ (as cited in Kurtz, Puher, & Cross, 2012), a 67-item questionnaire, is a self-report measurement tool commonly utilised in studies on college adjustment. The questionnaire has four subscales: Academic Adjustment, Social Adjustment, Personal-Emotional Adjustment, and Institutional Attachment. The Academic Adjustment subscale includes 24 items, the Social Adjustment subscale includes 20 items, the Personal-Emotional Adjustment subscale includes 15 items, and the Institutional Attachment subscale includes 15 items. The Institutional Attachment subscale shares 8 items with the Social Adjustment subscale and 1 item with the Academic Adjustment subscale. Baker and Siryk (as cited in Gerdes & Mallinckrodt, 1994; Martin, Swartz-Kulstad, and Madson (1999)) showed that the internal consistency reliability is quite high for the full SACQ scale, ranging from .89 to .95, with the subscales' internal consistency reliability ranging from .73 to .91. Several applications of the SACQ have provided correlations ranging from .68 to .90 between the subscales and the full scale (Gerdes & Mallinckrodt, 1994). In consideration of these correlations, four basic components in academic probation i.e. academic, psychological, social and economic factors, were investigated in this study. The interviews were written down and coded. They were then analysed in terms of content analysis through MAXQDA 12, and the results were visualised by showing the associations between the codes.

3. Results

Based on the answers of the students, four main factors for academic probation

were identified (see Figure 1).

3.1. Academic Factors

Three main issues were identified within academic factors leading to probation (see Figure 2). Lack of awareness was the first academic factor with students deciding to go to university without a specific purpose. They entered Higher Education because e.g. everybody else did so or because it was expected of them. Furthermore, although students who ended up on probation had deliberately opted for the ITU, they had neither chosen their department in a careful manner nor did they have any plans about what to do after graduation, or even see the

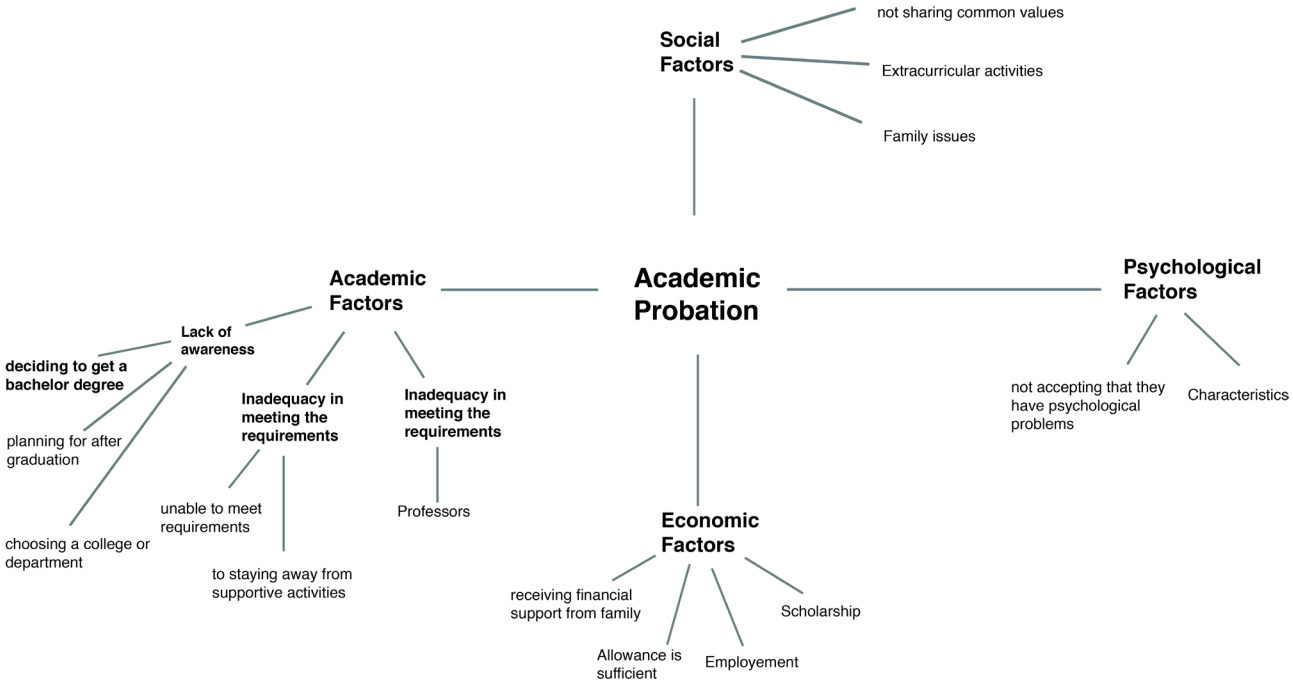

Figure 1. Main factors of probation.

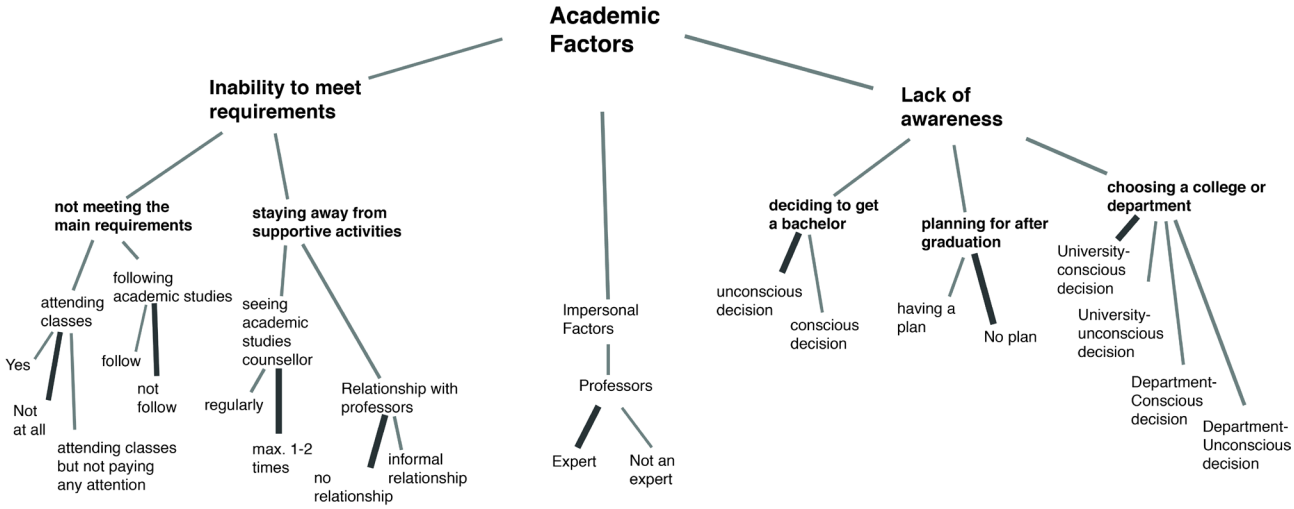

Figure 2. Academic factors of probation.

need for having such a plan. All they did was taking into consideration other individuals' advice, putting their faith in the hypothetical economic return of a given profession or simply relying on their performance in the university entrance exam.

A second issue that came to light was these students' inadequacy in meeting minimal requirements such as attending lectures. To make matters worse, they were at the same time also staying away from supportive activities. Gerdes and Mallinckrodt (1994) indicated that e.g. informal contact with professors was an indicator for not dropping out of students who were struggling academically. Furthermore, probation students did not take up the opportunity to see their academic counsellors or to get in touch with their professors outside of classes. Finally, although 65% of probation students indicated that their academics were on the whole experts in their field, 60% nevertheless thought that these academics were not all that good as lecturers.

3.2. Psychological Factors

Psychological factors play in important part in academic probation. As it can be seen in **Figure 3**, psychological factors can be divided into two categories: specific characteristics, and an overall refusal to accept having any psychological issues. Aspelmeier et al. (2012) showed that certain types of locus of control were associated with GPA. We did however not observe a behavioural trend in locus of control in our study as the number of students on probation who regarded themselves as responsible for their problems was close to the number of students who blamed others for their problems.

Decision-making difficulties, pessimism and feelings of worthlessness were specific characteristics of probation students. Although 74% of students stated

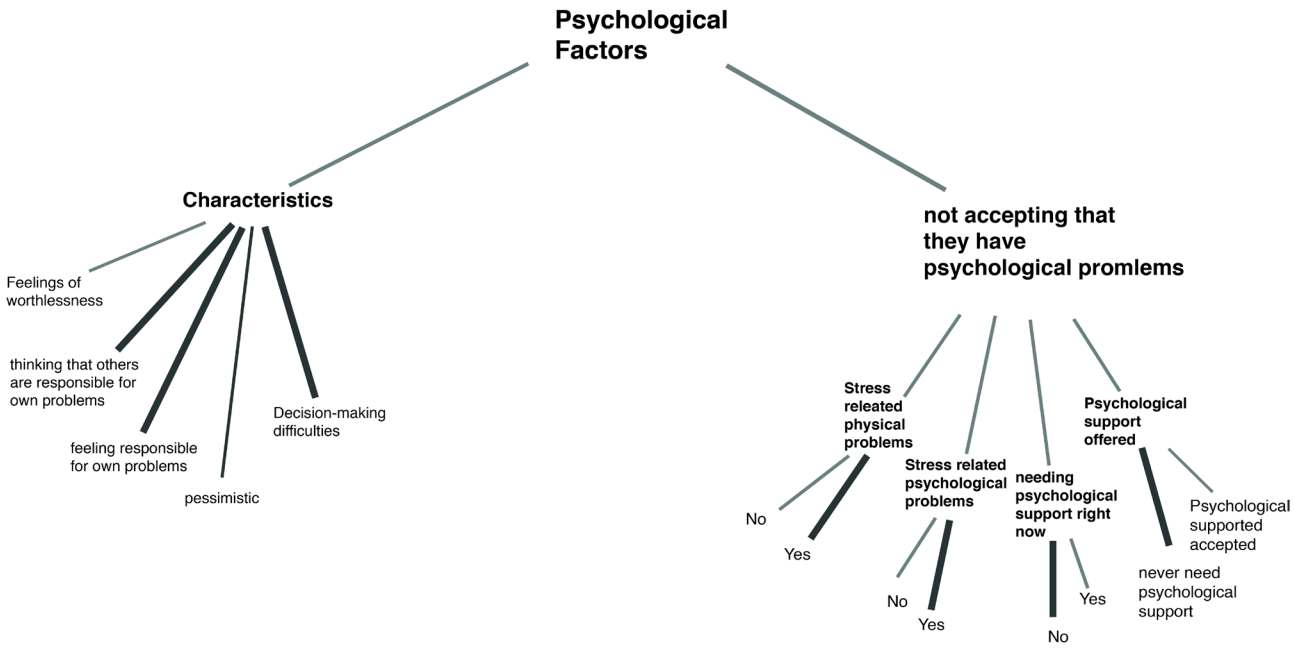

Figure 3. Psychological factors of probation.

that they did not need any psychological support, 87% of them were suffering from stress-related psychological problems and 81% from stress-related physical problems.

3.3. Social Factors

Four specific components emerged among the social factors as given in the answers of the students on probation (see **Figure 4**). They believed that they were not sharing common values with their fellow students. Gerdes and Mallinckrodt (1994) showed that students from socially disadvantaged backgrounds may experience a certain discomfort because of feeling different from other students. In our study, 42% of probation students saw themselves as being different from their fellow students, and 40% would, given the chance to do so, choose other fellow students.

Gray, Vitak, Easton, & Ellison (2013) and Plant, Ericsson, Hill, & Asberg (2005) had pointed out the influence of extracurricular activities pertaining to academic probation. In our study, extracurricular activities and family issues were also found to play a part in academic probation. Thus, a quarter of those probation students who were living away from their families admitted to being homesick. And although 64% of students on probation were living with fellow students, 81% would rather be living on their own if they could afford to do so as they said having issues with their roommates. Nevertheless 58% of probation students indicated that they shared their problems with friends.

3.4. Economic Factors

Finally, economic factors played an important role in academic probation. Employment, level of allowance, scholarship and financial support from family were taken into consideration (see **Figure 5**). Of the 87% of students on probation

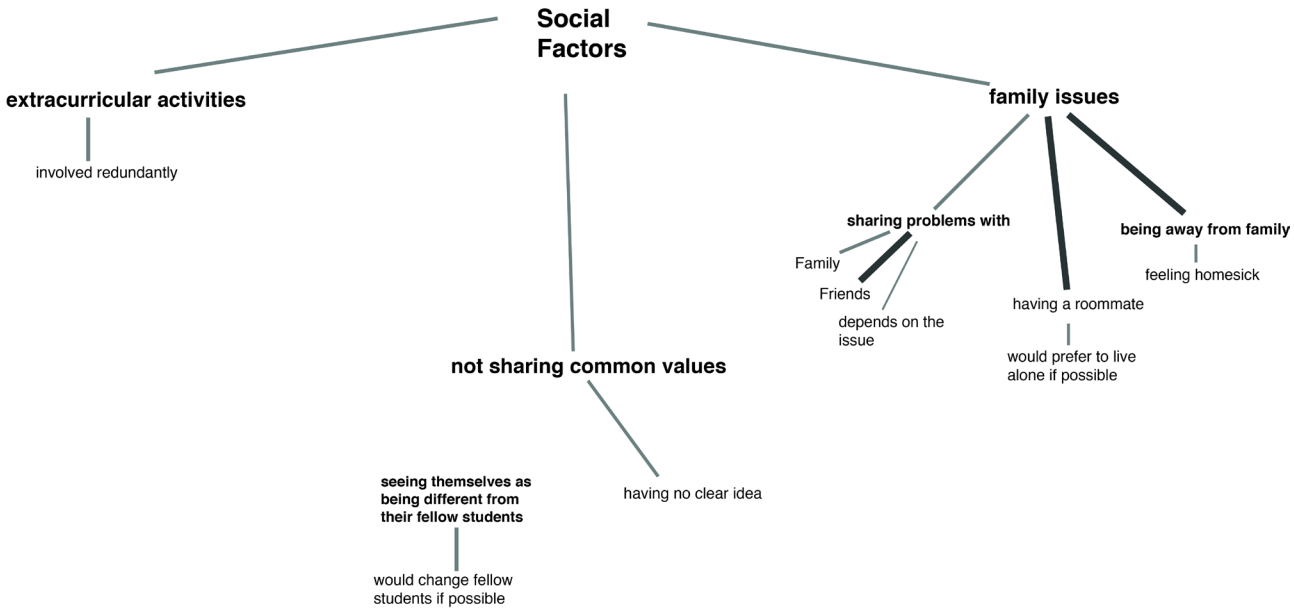

Figure 4. Social factors of probation.

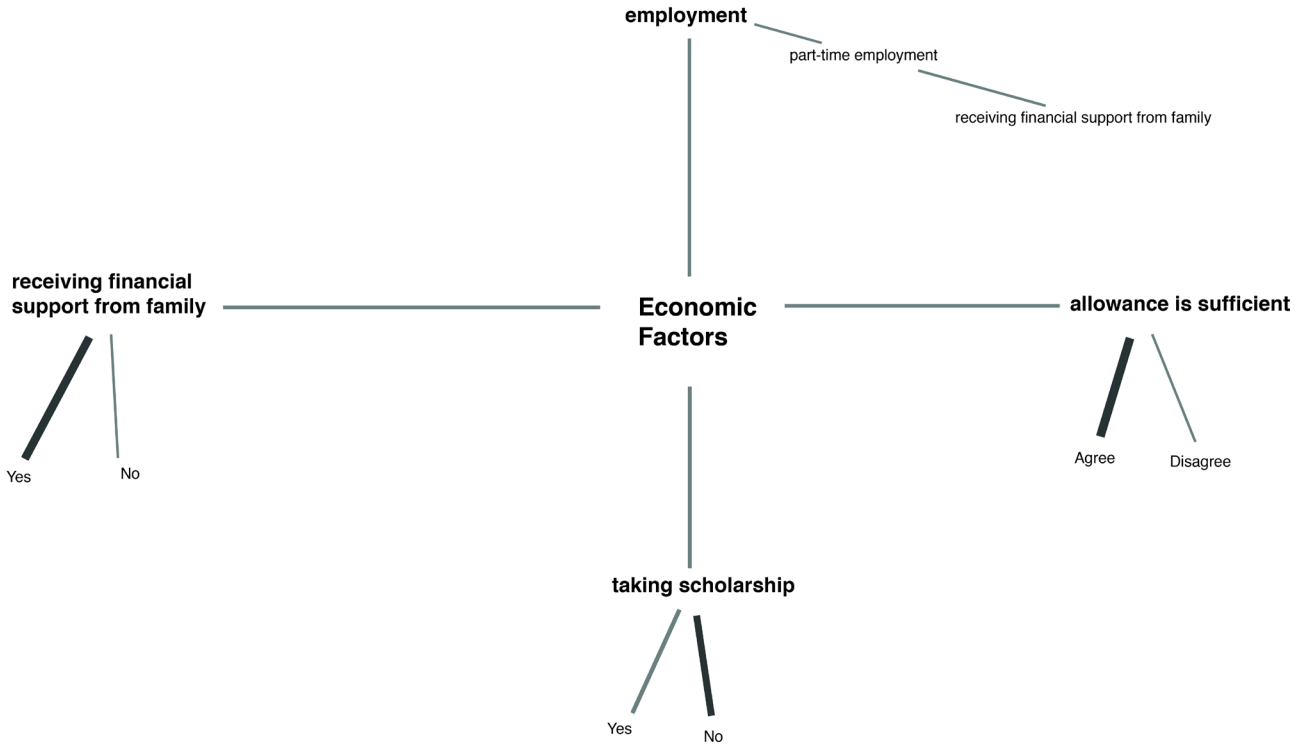

Figure 5. Economic factors of probation.

who were receiving financial support from their families, a quarter thought this was back-breaking for their families. 84% of probation students were satisfied with the level of their allowance, and 42% were part-time employees. And even though 87% of part-time employees were supported financially by their families, they thought that employment affected their scores negatively. Bodvarsson and Walker (2004) however found that students who received financial help from their families failed more courses than students who did not receive such support. Moreover, the likelihood of them falling into probation was higher than that of students who did not receive such help and their GPA were also lower. Finally, because of their low GPA, probation students were unable to take on a scholarship.

3.5. Probation Reasons from the Point of View of Probation Students

It is important to understand what students think in order to help them improve their performance and come out of academic probation. Hence, apart from those factors mentioned above, we also looked at the reasons given by students for academic probation (see **Figure 6**). Lack of discipline and laziness were the most frequently mentioned factors. Moreover, they singled out motivation and concentration problems as main factors for their failure. As already stated regarding the academic factors contributing to academic probation, students also emphasised lecturing styles and the degree of difficulty of courses (Smith & Winterbottom, 1970; Dunwoody & Frank, 1995). Even though lecturing styles and

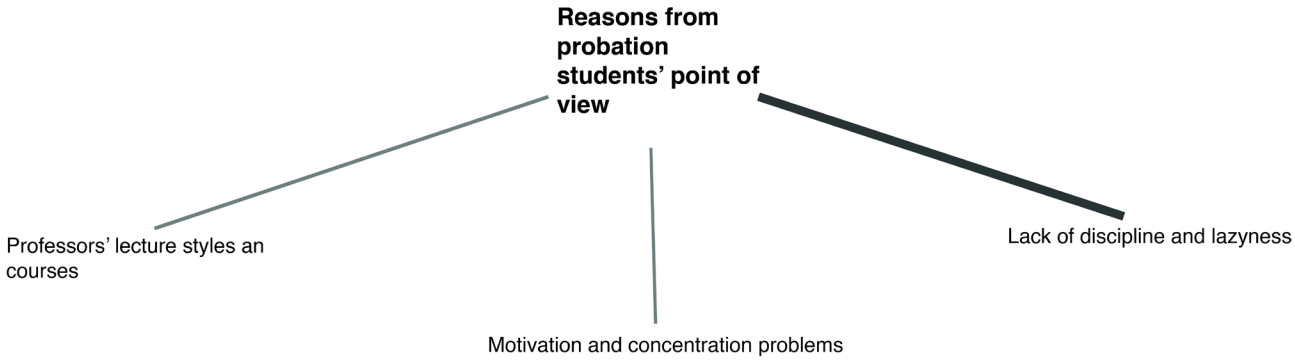

Figure 6. Reasons for probation from probation students' point of view.

course requirements were put forth as reasons for poor academic performance by students on academic probation, the Trendence Graduate Barometer 2015 report on the ITU does not support this observation as the work of the academic staff was found to be a good performance indicator for the ITU.

The ITU Career Centre (ICC) recognised the necessity to motivate students to formulate a plan in order to improve their academic standing. Hence the ICC worked hard to raise the awareness of the university on the issue of academic probation. The ICC also looked into using existing tools in a more efficient way and put great effort into the development of new tools in order to achieve effective results in the prevention of students falling into academic probation.

4. Intervention Tools

4.1. Enhancing Existing Tools

4.1.1. Reorganising the ICC Team

People are the most valuable resource in any organisation as without motivated individuals no improvement or innovation is possible. Therefore, a first step was the reorganisation and strengthening of the ICC team. Now, the ITU Career Centre consists of 3 academics and 2 specialists, and 6 volunteer part-time student assistants. This team is now responsible for the provision of accurate career guidance to the ITU students through organisations such as the ITU Career Summit (ICS), specific company events, career counselling sessions and social media services. Those events are of the greatest importance as they show students that they can find a job or an internship even if they do not have a wide network of contacts. The ITU requires students to complete a minimum of 3 (2 for some departments) internships; this is very difficult for some students who have come from distant regions of Turkey and who are trying to get on in the metropolitan city that is Istanbul. The ICC puts great emphasis on "On the Campus Recruitment" (OCR) and holds a variety of events during the year with employers from the private and public sectors, as well as NGOs. To this end the ICC cooperates with student clubs, other universities, some high schools, legal authorities, various institutions and non-governmental organisations, etc. through networking and collaboration. Furthermore, an experienced expert in organising events was hired to help with the preparation of career fairs and in

communicating with businesses. Additionally, a psychologist specialised in human resources transferred from the private sector to the ICC as a career consultant. This psychologist knows exactly what companies expect from new graduates and helps students to meet those demands. Since the reorganisation of career centre, task management has become more efficient and the effectiveness of the ICC has increased dramatically.

4.1.2. Career Summit and Events

The ITU Career Centre is a bridge between students and business. Every year in the last week of February, it organises the biggest career summit of Eurasia with the aim to facilitate contact between students and employers. Companies arrange workshops, present case studies, set up interviews and accept job and internship applications. While in the past the ITU Career Summit happened in one place only, it has now been moved to nine different locations on several university campuses, thus giving more students the opportunity to attend the fair and to meet the world of business. In meetings with human resources specialists, students may come to realise that they must increase their GPA, that they must come up with a plan or several plans for life after graduation in order to find employment. Gerdes and Mallinckrodt (1994) found that students who struggle academically, greatly benefit from career planning assistance as it helps them to formulate goals. When organising the ICS, the ICC also involved the student clubs thus providing students with self-improvement opportunities in organising, planning, and communication skills. Moreover, this experience promotes bonding amongst fellow students as they share common interests, purposes and values. The ICS'16 was a huge success with the presence of 137 companies and with close to 30,000 students attending.

4.1.3. Online Services

Marketing of one's services and gaining recognition for one's work is crucial to improve one's efficiency. Here social media play an important part as the ICC has more than 165,000 followers on social media. In addition, the ICC relies on more traditional tools such as information bulletins and banners. Thus, the ICC can reach and inform more people, raise their awareness of its activities and inform them about new developments.

4.1.4. Career Counselling

Furthermore, the ITU Career Centre has a comprehensive offer in career counselling services to ITU students such as writing a job application letter, a CV, familiarising them with interview techniques as well as career counselling proper.

Students on probation were actively encouraged to take on the offer in counselling. They were informed that laziness and lack of discipline were not inborn and that they could choose to work hard. And if they did not know how to go about it, students on probation were given support in how to improve their study skills. Furthermore, students suffering from stress-related issues were di-

rected towards the ITU Psychological Counselling Services.

Those students at the Istanbul Technical University (ITU) who had won a scholarship because of their excellent performance in the university entrance exam, and who later lost it because of their poor academic performance and ended up on probation, were invited to go and see the Office of Scholarships to look for alternatives they could benefit from if their academic standing were to improve.

4.1.5. Other Forms of assistance

Absenteeism was one of the academic factors leading to probation. Students were encouraged to adjust their extracurricular activities to their workload and reminded that attending classes has a greater impact on their performance than self-study (Dolton, Marcenaro, & Navarro, 2003). Attending classes also promotes good communication between lecturers and students, and gives students the opportunity to debate course topics with their fellow students. The academics at the ITU also recommend that students should, if possible, not work in their freshman and sophomore years to prevent absenteeism.

Students on probation were incited to go and see their academic advisors to discuss their courses and life at university. Through career counselling, those students who were dissatisfied with their study choice could then be shown various alternatives, ranging from transferring to a different department to opting for different study programmes. If probation was related to having made an initial "bad" choice, these alternatives could broaden perspectives for these students.

4.2. Creating and Implementing New Tools

4.2.1. Web Portal

In today's world, a digital presence is a must. Seeing the need for an online platform early on, the ICC launched a web portal named the ITU career and Talent management (ITU-KAYS). This portal facilitates communication with students and allows the publication of announcements, internships and job opportunities for ITU students. Furthermore, students can also make an appointment with a career counsellor through ITU-KAYS. To date almost 200 employers and over 8000 students are registered as regular users on ITU-KAYS.

4.2.2. New Career Fair

In 2015 a new event named the National Engineering Career Fair (TUMKAF), was added to the long-established ICS. 66 companies were present with their booths at TUMKAF and 7530 engineering students and graduates from all over Turkey attended.

4.2.3. Setting up of Open Areas

A good study environment is instrumental to effective learning (Astin, 1984). With this concern in mind an existing hall was converted into a study room allowing those students who cannot study in their dormitory or their home to do

so in the best possible conditions. Finally, with the aim to promote greater socialising between students, the rectorate also agreed to the redevelopment of cafés and restaurants on ITU grounds.

4.2.4. Other Measures

ITU has a long-established reputation in engineering education in Turkey since 1773. Today it owns 6 technoparks under the name of ARI Teknokent where more than 200 Research & Development projects are carried out, thus providing many openings for ITU students such as internships, project works, and part-time or full-time job opportunities. ARI Teknokent also offers via the ITU Seed start-up and entrepreneur ecosystem financial support to many ITU students who have creative and innovative ideas. In this regard, beyond an engineering education of the highest quality, the ITU ARI Teknokent also presents students with opportunities to realise their own innovative ideas through projects.

One of the reasons why students fall into probation originates in the decisions they make at high school on what and where to study. It is therefore important to highlight the ongoing developments implemented by the ICC on career and talent management. A master degree programme and a certificate programme have been elaborated and a graduate programme will accept applications from prospective students this fall. The certificate programme has been offered twice and attracted considerable attention. Its objective is to provide career counsellors with academic qualifications of a high standard. The ICC believes that these counsellors will ultimately be in a very good position to help students to make "better" decisions regarding universities, study fields, and ultimately also occupational choices.

5. Conclusion

These efforts brought about great rewards. The rate of academic probation fell from 23.46% to 17.08% (ITU Dean of Student and Registrar's Office, 2014, 2016). According to the Universum Talent Research (2015), 85% of ITU students use one or more of the ICC career services on offer to great satisfaction. Furthermore, ITU students show a keener interest in career fairs where they can meet prospective employers than students from other universities. Finally, Trendence (2015) indicates that the ITU career services are amongst the best there are.

Heisserer and Parette (2002) underlined that the development and implementation of a successful intervention programme that supports students in reinstating good academic standing are both challenging and rewarding. This is partially because the responsibility does not lie with the counsellors and institutions only (Ahmed, Chowdhury, Rahman and Talukder, 2014) as the primary responsibility rightly lies with the students. They must be motivated to come out of academic probation and willing to cooperate as otherwise none of these efforts will have any impact.

To conclude, it is important to emphasise that in our study we took only a single instant photo of academic probation at ITU. What we need to do now is to create a photo album to look at the situation at other universities and to identify possible differences and similarities. Moreover, our sample did not include any students with good academic standing. Their views on probation might offer different perspectives leading to further studies. Such an approach could also lead to the elaboration of a mentorship programme, matching probation students with academically successful ones.

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Personality and Intelligence in a High Ability Sample

Adrian Furnham[1,2]

[1]Research Department of Clinical, Educational and Health Psychology, University College London, London, UK
[2]Norwegian Business School, Oslo, Norway
Email: a.furnham@ucl.ac.uk

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Abstract

In all 754 adults (518 males) in a high achieving school-leaver sample completed two intelligence tests (Ravens Progressive Matrices; Graduate Management Assessment Verbal and Numerical) and the 16PF. The study was concerned with the relationships between personality and intelligence. Correlational and regression analyses showed a few of the 16PF factors (particularly Reasoning and Sensitivity) to be related to the various cognitive ability test scores. The study shows that specific personality traits are modestly but consistently correlated with intelligence test scores. Implications are considered.

Keywords

Personality, Intelligence, Ravens, 16PF, High Ability

1. Introduction

There is a growing interest in the relationship between personality traits and intelligence (Furnham, 2008; O'Connor & Paunonen, 2007; Poropat, 2009; von Stumm, Chamorro-Premuzic, & Ackerman, 2011). Studies have looked at the relationship between personality and intelligence (Chamorro-Premuzic & Furnham, 2004, 2005, 2006; Chamorro-Premuzic, Furnham, & Moutafi, 2004; Furnham, Forde, & Cotter, 1998; Moutafi, Furnham, & Paltiel, 2005; Furnham & Moutafi, 2012).

Studies have been done using various measures of both personality and intelligence but the results tend to show correlations are low and that Neuroticism is negatively, and Conscientiousness and Openness positively, correlated with intelligence. There are however various differences as a function of which personality and intelligence tests are use, particularly the latter. This study aims to ex-

amine the relationship between the 16PF and three well established intelligence tests. It extends the analysis of Furnham and Crump (2013).

This study extends and replicates the work of Djapo et al. (2011) who tested the relationship between the 16PF, Ravens Advanced Progressive Matrices and the Mill Hill Vocabulary Scales on 105 Bosnian 3rd graders. Half of the 16 factors were (modestly but significantly) correlated with fluid intelligence (particularly *Reasoning* positively and *Sensitivity* negatively) but there were far fewer significant correlates (two only) of crystallised intelligence. The authors calculated the "big five" Cattellian higher order factors and performed regressions. Only the regression for fluid intelligence was significant and accounted for a quarter of the variance. Two higher factors (*Tough-Mindedness* and *Independence*) were positive predictors and two (*Extraversion* and *Anxiety*) were negative predictors of fluid intelligence.

This study advances this modest study *first* by having a large adult population of over 700 people, *second* by having three measures in intelligence including a numeric and vocabulary measure, and *third* by exploring the role of sex differences in the relationship between personality and intelligence. The 16PF is an unusual test in that one of the subscales is a 15 item ability measure labelled *Reasoning* that assesses abstract reasoning and problem solving. Many studies have demonstrated that it correlates in the region of r = .5 with other well established measures like the WAIS-R Full scale (Abel & Brown, 1998; O'Connor & Little, 2003). Note that unlike intelligence tests, the 16PF is not timed, yet this factor (Reasoning) seems a good index of intelligence. As a consequence it was predicted that this 16PF factor is most highly correlated with (all and any) measures of intelligence and that in a regression the 16PF would account for more of the variance (>10%) than other studies which have regressed intelligence test scores on personality variables.

2. Method

2.1. Participants

There were 754 participants of which 543 were male. Their mean age was 29.74 years (SD = 2.67: Males 29.99, SD = 2.73; Females 29.17, SD = 2.44). Nearly all (92%) were Asian graduates. Just over three-quarters (77.1%) had studied in the science pre-university stream as opposed to the arts stream. They were all talented young people assessed as part of a high potential scheme in a government organisation that assessed people for promotion in the public sector. In all 426 males and 155 females had science degrees and 92 males and 81 females arts degrees. All had university standard English fluency.

2.2. Tests Used

2.2.1. Ravens Progressive Matrices (Raven, 1965)

This is a very well established "find the odd-man-out" test of logical reasoning. Participants are shown a block (3 × 3) of patterns with the final one missing. They are presented with 8 alternatives to find the "correct" one by working out

the relationship between the patterns. The alpha was .93.

2.2.2. The Graduate Management Assessment (GMA-A)

The GMA-A is a high level test of abstract reasoning ability. It measures the ability to think conceptually to discover underlying patterns within a set of information and to switch easily between contexts and levels of analysis. This test is composed of two parts: Verbal and Numerical. Each part takes 30 min to complete.

A. The *Verbal* test presents candidates with a short piece of factual prose together with four statements. Respondents have to decide whether the statements are true, false or cannot tell, from the information provided. The participants are encouraged to detach themsleves from their own beliefs and prejudices when answering the questions. The Alpha was .89.
B. The *Numerical* test presents the subjects with a short scenario, followed by three questions. Respondents have to choose a right answer from a set of 16 possible responses. It aims at testing the problem-solving skills of the participants. The Alpha was .90.

2.2.3. Sixteen Personality Factor (5th Edition) Cattell, Cattell, & Cattell (1990)

This is an established 40 year old, 185 multiple choice item test that measures 16 dimensions of personality. Those scores can be combined into five global factors. The test has been used extensively over the years and is one of the most psychometrically validated of all personality tests (Kline, 1995).

2.3. Procedure

All participants were applicants for a high potential talent government scheme which offered free overseas tution to successful candidates. They were all tested under exam conditionover a two period. Tests were all given in the same order. They were all given feedback on their performance.

3. Results

3.1. Correlations

Table 1 shows the correlations between the three ability tests and the 16 PF traits. Overall there were relatively few significant correlations and none greater than r = .19. There was a consistent finding (i.e. significant positive correlations) for Factor B (Reasoning) which is to be expected. There were two other significant correlates of the Raven's test: Those who scored higher on Factor A (Warmth) and I (Sensitity) scored lower on this test. There were four additional significant correlates of the GMA Numerical scale. Those who scored lower on Factors A (Warmth), I (Sensitivity), and O (Apprehensiveness) but higher on N (Privateness) scored higher on this test. In addition to Factor B, there were three significant correlates of the GMA Verbal test: those who scored higher on I (Sensitivity) and M (Abstractness) but lower on Q3 (Perfectionism) did better on this test.

Table 1. Correlations between the 16 factors and the three intelligence test scores.

	RPM	*GMA(N)*	*GMA(V)*
A. Warmth	−12*	−10**	−02
B. Reasoning	16**	19**	12**
C. Emotional Stability.	00	−02	00
E. Dominance.	00	00	07
F. Liveliness	−01	00	01
G. Rule Conscientiousness.	−03	03	−00
H. Social Boldness.	−04	−05	03
I. Sensitivity.	−12**	−12**	16**
L. Vigilance.	−03	03	00
M. Abstractness	00	07	11**
N. Privateness.	02	12**	03
O. Apprehensiveness	−06	00	−02
Q1. Open to Change.	01	−12**	04
Q2. Self-Reliance	05	05	05
Q3. Perfectionism.	−06	−06	−11**
Q4. Tension.	00	02	01

**$p < .01$, *$p < .05$. N = 794.

3.2. Regressions

Table 2 shows the results of three stage-wise regressions. All were significant althougth there was a different pattern. The regression for the Raven's test showed that overall only 4% of the variance was accounted for, and that was by Factor B (Reasoning) and Factor I (Sensitivity).

The regression with the GMA Numerical score as the criterion variable showed sex and age alone accounted for 9% of the varaince with younger males doing best. When the 16 personality factors were included three accounted for another 5% of the variance. Those who scored higher on B (Reasoning) and N (Privateness) but lower on Q1 (Open to Change) did best. The regression for the GMA Verbal score showed older participants did better and that this accounted for 4% of the variance. Four 16PF factors accounted for an additional 5%: Those who scored higher on B (Reasoning), E (Dominance) and I (Sensitivity), but lower on Q3 (Perfectionism) did best. When the three ability tests were combined the results showed the two demographic factors accounted for 4% of the variance with younger males doing best. Three 16PF factors accounted for a further 7% of the variance: Those who scored high on B (Reasoning) and E (Dominance) but low on Q3 (Perfectionism) did best.

3.3. Higher Order Factors

Various reports suggest the 16 PF factored into a five factor solution. Furnham

Table 2. Regressional results with intelligence tests as the criterion variables and sex, age and personality as the predictor variables.

	RPM		N		V		TOT	
	Beta	**t**	**Beta**	**t**	**Beta**	**t**	**Beta**	**t**
Gender	−02	0.51	−20	5.10***	02	0.45	−10	2.73**
Age	−02	0.62	−18	4.69***	−21	5.38***	−21	5.63***
A. Warmth	08	1.56	00	0.11	−06	1.24	−06	1.18
B. Reasoning	**16**	4.15***	18	4.87***	13	3.48***	21	5.89***
C. Emotional Stability.	00	0.12	05	1.10	03	0.68	06	0.82
E. Dominance.	05	1.06	08	1.69	12	2.66***	12	2.68**
F. Liveliness.	04	0.81	06	1.35	−02	0.39	03	0.76
G. Rule conscientious.	00	0.09	04	0.91	05	1.21	05	1.15
H. Social Boldness.	−06	1.18	−04	0.74	00	0.13	−04	0.74
I. Sensitivity.	−12	2.67**	−07	1.56	15	3.39***	00	0.74
L. Vigilance.	04	1.07	−01	0.37	−01	0.38	03	0.81
M. Abstractness.	−02	0.38	05	1.21	02	0.51	03	0.73
N. Privateness.	−03	0.76	10	2.28*	00	0.22	04	0.97
O. Apprehension.	−03	0.64	00	1.16	−01	0.20	−02	0.44
Q1.Open to Change.	03	0.67	−10	2.37**	02	0.36	−03	0.75
Q2. Self Reliance.	06	1.18	04	0.79	05	0.96	06	1.36
Q3. Perfectionism.	−05	1.08	−04	0.99	−13	3.17***	−10	2.64***
Q4. Tension.	00	0.38	00	0.14	−02	0.55	01	0.24
Step 1 (gender/age)								
	F(2,726)=		4.76**		36.56***		14.76***	18.55***
Adj	R^2		01		09		04	04
Step 2 16P								
	(F,18,740)=		2.68***		7.02***		4.98***	5.97***
Adj	R^2		04		13		09	11

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

and Crump (2013) did an oblimin (oblique) rotation for this sample using the scree test to determine the number of factors. The factors were similar, but not identical to those in previous studies (Aluja & Blanch, 2004; Hofer, Horn, & Eber, 1997). They were labelled Extraversion, Anxiety, Self Control, Independence and Tough Mindedness. These higher order factors were then correlated with the three ability tests (see Table 3).

The results suggest Extraversion, Self Control and Independence are negatively associated with the three measures but that Tough Minded was positively associated particularly with the Ravens (r = .13). The same analysis was repeated for the five factors derived from the analysis. A similar set of correlation arose.

Table 3. Correlations between the 16PF higher order factors and the intelligence test scores.

	Mean	SD	E	A	Sc	I	Tm	RPM	ADV	V
Extraversion (E)	21.20	18.69								
Anxiety (A)	15.91	13.28	**−32**							
Self Control (Sc)	4.10	12.50	−23	−20						
Independence (I)	58.67	12.17	**62**	−22	−15					
Tough-Minded (Tm)	3.01	9.77	28	08	**−33**	20				
Ravens PM (RPM)	56.19	3.09	−07	−03	−03	−03	**13**			
Numerical (ADV)	21.89	4.29	**−08**	02	−04	−04	**09**	**36**		
Verbal (V)	36.85	4.50	−02	00	**−09**	**−09**	01	14	12	

Correlation > .15 are $p < .001$.

This factor 4 which is similar to the Self Control factor was significantly negatively correlated with all three ability tests scores (−.09 > r < −.11). Equally the fifth factor was negatively correlated the Ravens (r = .10) and GMA Numerical (r = −.11) but positively correlated with the GMA Verbal test score (r = .13).

Similarly the same regressions as in Table 2 were run except this time with the five higher order scores. All regressions showed that Factor one, four and five were negative predictors of the intelligence test scores. The regression that accounted for most of the variance was that for GMS Verbal ($F(7,751) = 8.94$, $p >$ 001; $AdjR^2 = .07$. The betas for the five factors in order were −.21, −.08, .09, −.11 and .11 showing three negative and two positive predictors. Thus the regressions of the Big Five derived from the 16PF accounted for about the same amount of variance as that of the analysis with the 16 factors.

4. Discussion

Correlations between the 16PF personality traits and the three intelligence test scores showed few significant correlations and only limited consistency across the three measures. As predicted, and found in previous studies, the correlation between Factor B (Reasoning) and the three intelligence tests was significant and positive but lower (.12 > r < .19) than in previous studies. The results for Factor I (Sensitivity) were also in accordance with the previous literature showing to be positively correlated with verbal/crystallized measures, but negatively correlated with fluid/numerical measures (Djapo et al., 2011). It is related to Neuroticism on the Big Five Model and Intuition in the MBTI literature which is confirmed by the description of High and Low scorers in the 16PF manuals.

Many previous studies in the area that examined the relationship between personality and intelligence showed that despite many significant correlations, regression showed that as little as 3% (only) of the variance could be accounted for even when there was large sample and robust and reliable tests were used. This study was no exception in that the 16PF factors could only account for 3%

of the variance (after sex and age were controlled) for the Ravens. This is much lower than the 26% accounted for in the study by Djapo et al. (2011). The regressional results were however interesting for three reasons. First, gender and age accounted for between 1% and 9% of the variance. The results showed that younger people scored higher and that on numerical intelligence, males scored much higher than females. In fact, demographics accounted for more than the 16 personality factors in total. Second, as may be expected Factor B (Reasoning) was a consistent and the strongest predictor for all the regressions providing yet more evidence of the concurrent validity of this short 15 item scale. Third, the three regressions showed that different personality measures predicted different intelligence tests scores.

This study also provided concurrent evidence of the validity of the 16PF Reasoning scale which was modestly and significantly correlated with all three much longer ability measures. One explanation for the lower correlations in previous studies could be the potential restriction of range in this study, particularly for the intelligence tests. Previous studies using students however show similar scores to those found in this sample (Flynn & Rossi-Case, 2011), and students have been the overwhelmingly most common group on which to examine the relationship between personality traits and intelligence scores. Again, the results of the study illustrate the point that the precise nature of the relationship between personality and intelligence is dependent on the particular test used.

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How Teachers' and Students' Mindsets in Learning Have Been Studied: Research Findings on Mindset and Academic Achievement

Junfeng Zhang, Elina Kuusisto, Kirsi Tirri

Faculty of Educational Sciences, University of Helsinki, Helsinki, Finland
Email: junfeng.zhang@helsinki.fi

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Abstract

Empirical research on mindset has indicated that mindset can predict numerous individual achievement, including academic, cognitive, motivational, affective and even socioeconomic, through mediation of social-cognitive approaches. The purpose of this paper is to compile and synthesize articles published from 1998 to 2017 on the relationship between mindset and academic achievement and explore the role of mindset in academic achievement. The studies indicate that students' mindsets play several roles of cause and mediator in academic achievement. Mindset can also be an outcome of students' academic achievement. Furthermore, in some studies, the relationship between mindset and achievement is non-correlational. Meanwhile, teachers' mindsets play the role of cause or mediator in students' academic achievement, but no role of outcome. Limitations and recommendations for future studies are discussed.

Keywords

Mindset, Student, Learning, Teacher, Academic Achievement

1. Introduction

This study summarises research on the relationship between mindset and academic achievement. It surveys how mindsets in learning have been studied in teachers and in students. The participants in the reviewed studies were teachers and students at various stages of education, ranging from elementary school to adult education. Academic achievement refers to students' academic performance in school, measured mainly by grades.

The term "mindset" in learning was officially proposed by Carol Dweck in 2006. Her theory of mindset is built on a positive psychology approach in which

human intelligence is understood as a malleable quality. Dweck's earlier research (Dweck & Bush, 1976; Dweck, Davidson, Nelson, & Enna, 1978) on attribution of failure feedback could be regarded as the basis for the phrase "implicit theory of intelligence" (Dweck & Leggett, 1988; Levy & Dweck, 1999; Dweck, 2000), which later evolved into the concept of "mindset." In the two primary studies, students' attribution of failure feedback was divided into two categories: "solution-relevant or solution-irrelevant aspects" and "intellectual adequacy," which could be considered as an embryonic form of "fixed mindset" and "growth mindset." Dweck (2006) states that mindset "profoundly affects the way you lead your life" (p. 6). According to her definition, mindsets are beliefs that individuals hold about their most basic qualities and abilities. To have a fixed mindset (the entity theory) is to believe that human qualities are immutable; to have a growth mindset (the incremental theory) is the belief that basic qualities may be cultivated with effort.

Before the term "mindset" was proposed, Dweck (2000) had utilized the following concepts: implicit theories or implicit beliefs of basic human qualities, such as intelligence, ability, or personality. Although the phrase "implicit theory of intelligence" was generally used in studies over the past decades, recently, mindset has been used by an increasing number of scholars (Gutshall, 2013, 2014; O'Rourke, Haimovitz, Ballwebber, Dweck, & Popovic, 2014; Esparza, Shumow, & Schmidt, 2014). In current academic research, the meaning of "implicit theory of intelligence/ability" and "mindset" appears to be quite similar. In the present study, for the sake of convenience and uniformity, the term "mindset" will be used.

Previous reviews examining the relationship between students' mindsets and their performance indicate that mindset has an essential role in learning (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Dweck, 2000, 2012; Tirri & Kujala, 2016; Yeager & Walton, 2011). Dweck and Leggett's (1988) social-cognitive approach to motivation and personality specified how individuals' implicit theories oriented them to set different goals and influenced their perceived ability, their cognitive and affective mechanisms, and their behavior patterns. Dweck's (2000) review of findings based on her 30 years' research illustrated that people's implicit theories not only affected their self-judgment and played an important role in their adaptive or maladaptive functioning, but also affected the way in which they judged and treated others. Dweck's (2012) later research indicated that a growth mindset could "advance conflict resolution between long-standing adversaries, decrease even chronic aggression, foster cross-race relations, and enhance willpower" (p. 614). By introducing the SOMA (setting/operating/monitoring/achievement) model into a quantitative synthesis of research collected from the year 1988 to 2010, Burnette, O'Boyle, VanEpps, Pollack, and Finkel's (2013) meta-analysis demonstrated that implicit theories predicted self-regulatory process, which in turn, predicted goal achievement. Specifically, goal setting, goal operating, and goal monitoring hold promise for linking incremental beliefs directly to goal achievement.

By comparison, there is less research on the relationship between teachers' mindsets and students' achievement. However, intervention studies have demonstrated that mindset can be changed, and thus, students' academic achievement can be improved. After reviewing the theoretical basis of mindset interventions, Yeager and Walton (2011) concluded that the teachers' role could be potentially important, especially in interventions "targeting students' subjective experience" (p. 267) in school, "developing powerful yet stealthy persuasive tactics" (p. 285) for conveying psychological ideas, and "tapping into recursive processes" (p. 267) in the educational environment. Furthermore, according to a number of studies these social-psychological interventions can produce long-lasting gains in achievement. Tirri and Kujala (2016) reviewed brain research on mindset from the perspective of neuropsychological mechanisms, which indicated support for Dweck's theory: students' mindsets were adaptive and associated with their learning processes. Crucially, students could be influenced by appropriate interventions, since even "very brief intervention including knowledge on the value of effort and the potential for brains to adapt to new information has had a positive influence on students' learning" (p. 1236).

From previous reviews, we may conclude that, through the mediation of social-cognitive approaches, mindset can predict numerous aspects of individual achievement, including academic, cognitive, motivational, affective and even socioeconomic. However, those reviews on mindset seem to have some limitations. First, even though the reviews indicate that mindset affects learning, which is in line with Dweck's theory, they do not focus on academic achievement as measured by grades. Second, the nature of the approach is slightly singular and specific. For example, Burnette et al.'s (2013) meta-analysis provides a broad view of the relationship between self-regulation and mindset. However, in addition to quantitative studies, mindset has also been studied with qualitative and mix-method approaches, yielding valuable information about mindsets in classroom interaction, especially in connection with teachers (see Rissanen, Kuusisto, Hanhimäki, & Tirri, 2016). Thirdly, in previous reviews, mindset has mostly been regarded as an independent variable that predicts the dependent variable, which is achievement. However, the role of mindset could be investigated more broadly beyond "cause" alone.

In summary, previous research may lack a focus on the role of mindset in academic achievement. The purpose of the present article is to explore the role of mindset in students' academic achievement. The research questions are as follows:

Research Question 1: What is the role of students' mindsets in their academic achievement?

Research Question 2: What is the role of teachers' mindsets in students' academic achievement?

2. Method

The strategy for this review included electronic database searches and back-

tracking references. An initial search was made using the following databases: SCOPUS, ERIC, and Google Scholar. Searched keywords included mindset, implicit theory, Dweck, fixed mindset, growth mindset, entity theory/belief, incremental theory/belief, and academic achievement. We then utilized references to backtrack additional potentially relevant articles that might have been lost in the electronic database search. 22 articles from 1998 to 2017 which studied "mindset" and "academic achievement" and thus met our inclusion criteria were chosen for our data, 17 of which examined students' mindsets in learning (**Table 1**) and 5 examined teachers' mindsets (**Table 2**).

3. The Role of Students' Mindsets in Their Academic Achievement

Based on our review, the role of students' mindset in academic achievement will be discussed from four perspectives: mindset as a cause of the academic achievement, mindset as a mediator, mindset as an outcome, and mindset without an evident role (**Table 1**).

3.1. Mindset as a Cause

The causal role of mindset means that in an educational context, students' mindset serves to affect their academic achievement, which is the finding in 13 articles. These studies include interventions that illustrate the powerful effect of mindset teaching in students' academic achievement among American primary-school students (Mueller & Dweck, 1998), American secondary-school students (Blackwell, Trzesniewski, & Dweck, 2007; Good, Aronson, & Inzlicht, 2003), and African-American college students (Aronson, Fried, & Good, 2002). For example, after three sessions in which teachers advocated and taught a growth mindset and the malleability of intelligence to an African-American group, these students not only achieved higher grades, but also reported enjoying and valuing their academic studies more (Aronson et al., 2002). By comparison, in studies conducted among fifth graders in public elementary schools in the United States, Mueller and Dweck (1998) found that individual praise of students' intelligence weakened motivation and led to their low achievement.

The causal role of mindset in academic achievement was principally reflected through intermediate variables. A growth mindset predicted a higher achievement through the intermediate variables of goal setting (e.g., performance and learning goals), goal operation (e.g., helpless and mastery-oriented strategy), and goal monitoring (e.g., negative emotion and expectations) (Ahmavaara & Houston, 2007; Fonseca et al., 2009; Leondari & Gialamas, 2002). For example, in Greek studies by Leondari and Gialamas (2002) and a British study by Ahmavaara and Houston (2007), the causal role of mindset in achievement was realized through "perceived competence," which was regarded as an important variable linking mindset with achievement. These results were consistent with Dweck's (2000) conclusion that the impact of mindset was mediated by perceived performance.

Table 1. The role of students' mindsets in academic achievement.

	Author (year)	Title	Sample			Method		Role of Mindset
			Participant	Size (gender)	Grade (country)	Collecting	Analyzing	
1	Ahmavaara and Houston (2007)	The Effects of Selective Schooling and Self-concept on Adolescents' Academic Aspiration: An Examination of Dweck's Self-Theory	Student	N = 856 (M = 427, F = 429)	M (Britain)	Q	DS & RA & PMA	Cause
2	Aronson, Fried, and Good (2002)	Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence	Student	N = 79	U (USA)	Q	ANOVA & FA	Cause
3	Blackwell, Trzesniewski, and Dweck (2007)	Implicit Theories of Intelligence Predict Achievement Across an Adolescent Transition: A Longitudinal Study and an Intervention	Student	Study 1: N = 373 (M = 175, F = 198); Study 2: N = 99 (M = 50, F = 49)	M (USA)	Q	RA & HLM	Cause
4	Chen and Pajares (2010)	Implicit Theories of Ability of Grade 6 Science Students: Relation to Epistemological Beliefs and Academic Motivation and Achievement in Science	Student	N = 508	E (USA)	Q	DS & PMA	Cause
5	Claro, Paunesku, and Dweck (2016)	Growth Mindset Tempers the Effect of Poverty on Academic Achievement	Student	N = 168,203	E (Chile)	Q	HLM	Cause/ Mediator
6	Dupeyrat and Mariné (2005)	Implicit Theories of Intelligence, Goal Orientation, Cognitive Engagement, and Achievement: A Test of Dweck's Model with Returning to School Adults	Student	N = 76 (M = 31, F = 45)	M (France)	Q	FA	No
7	Fonseca et al. (2009)	When Depression Mediates the Relationship Between Entity Beliefs and Performance	Student	N = 353 (M = 175, F = 178)	M (France)	T & Q	RA	Cause
8	Gonida, Kiosseoglou, and Leondari (2006)	Implicit Theories of Intelligence, Perceived Academic Competence, and School Achievement: Testing Alternative Models	Student	First phase: N = 232 (M = 115, F = 117); Second phase: N = 187 (M = 91, F = 96)	E & M (Greece)	Q	ANOVA	Outcome
9	Good, Aronson, and Inzlicht (2003)	Improving Adolescents' Standardized Test Performance: An Intervention to Reduce the Effects of Stereotype Threat	Student	N = 138 (M = 76, F = 62)	M (USA)	I	ANOVA	Cause
10	Cury, Fonseca, Zahn, and Elliot (2008)	Implicit Theories and IQ Test Performance: A Sequential Mediational Analysis	Student	Study1: N = 47 (M = 23, F = 24); Study 2: N = 86 (M = 41, F = 45)	M (France)	Q	DS & FA & RA	Cause
11	Heyman and Dweck (1998)	Children's Thinking about Traits: Implications for Judgments of the Self and Others	Student	Study 1: N = 86 (M = 40, F = 46); Study 2: N = 116 (M = 58, F = 58)	E (USA)	I	FA & ANOVA	Cause
12	Leondari and Gialamas (2002)	Implicit Theories, Goal Orientations, and Perceived Competence: Impact on Students' Achievement Behavior	Student	N = 451 (M = 204, F = 247)	E & M (Greece)	Q	FA	Cause/ No[1]
13	Mouratidis, Michou, and Vassiou (2017)	Adolescents' Autonomous Functioning and Implicit Theories of Ability as Predictors of Their School Achievement and Week-to-Week Study Regulation and Well-being	Student	N = 179 (M = 64, F = 115)	M (Greece)	Q	DS & FA & RA	Mediator

Continued

14	Mueller and Dweck (1998)	Praise for Intelligence Can Undermine Children's Motivation and Performance	Student	Study 1: N = 128 (M = 58, F = 70); Study 2: N = 51 (M = 25, F = 26); Study 3: N = 88 (M = 40, F = 48); Study 4: N = 51 (M = 22, F = 29); Study 5: N = 46 (M = 20, F = 26); Study 6: N = 48 (M = 25, F = 23)	E （USA）	SPM	ANOVA, T-t, Chi-s A.	Cause
15	Robins and Pals (2002)	Implicit Self-Theories in the Academic Domain: Implications for Goal Orientation, Attributions, Affect, and Self-Esteem Change	Student	N = 508 (M = 224, F = 284)	U (USA)	Q	FA & RA & PMA	No
16	Romero, Master, Paunesku, Dweck, and Gross (2014)	Academic and Emotional Functioning in Middle School: The Role of Implicit Theories	Student	N = 115 (M = 48, F = 67)	M (USA)	Q	HLM	Cause
17	Zeng, Hou, and Peng (2016)	Effect of Growth Mindset on School Engagement and Psychological Well-Being of Chinese Primary and Middle School Students: The Mediating Role of Resilience	Student	N = 1260 (M = 658, F = 602)	E & M (China)	Q	SEM	Cause

[1]The reason this study has both "cause" and "no" roles is that authors mention that "incremental beliefs were not related to academic achievement. An explanation for this finding might be that incremental beliefs influence achievement indirectly through the adoption of a specific goal orientation."

Table 2. The role of teachers' mindsets in students' academic achievement.

	Authors (year)	Title	Sample			Method (see **Appendix**)		Role of Mindset
			Participant	Size (gender)	Grade (country)	Collecting	Analyzing	
1	Jonsson and Beach (2012)	Predicting the Use of Praise among Pre-Service Teachers: The Influence of Implicit Theories of Intelligence, Social Comparison and Stereotype Acceptance	Teacher	Study 1: N = 176 (M = 23, F = 151); Study 2: N = 151 (M = 10, F = 140, 1 missing)	E & M (Sweden)	Q	RA & FA	Cause
2	Kärkkäinen and Räty (2010)	Parents' and Teachers' Views of the Child's Academic Potential	Teacher	Parent: N = 97 (M = 46, F = 50, 1 missing); Teacher: N = 8 (M = 3, F = 5)	E (Finland)	Q	ANOVA	Cause/ Mediator
3	Kärkkäinen, Räty, and Kasanen (2010)	How Are Children's Perceptions of the Malleability of Their Academic Competencies Related to Their Teachers' and Parents' Views?	Teacher	Student: N = 103 (M = 51, F = 52); Parent: N = 97 (M = 46, F = 50, 1 missing); Teacher: N = 8 (M = 3, F = 5)	E (Finland)	Q	FA	Cause
4	Schmidt, Shumow, and Kackar-Cam (2015)	Exploring Teacher Effects for Mindset Intervention Outcomes in Seventh-Grade Science Classes	Teacher	Student: N = 160 (M = 67, F = 93); Teachers: N = 2 (F = 2)	M (USA)	O & Q	FA & B-S-A	Cause
5	Shim, Cho, and Cassady (2013)	Goal Structures: The Role of Teachers' Achievement Goals and Theories of Intelligence	Teacher	N = 209 (M = 45, F = 164)	E (USA)	S	FA & RA & Chi-s A	Cause

Apart from the intermediate variables outlined above, studies illustrated that mindset could also predict academic achievement by the mediation of resilience, socioeconomic strata and attribution. A nationwide study in Chile (Claro, Paunesku, & Dweck, 2016), which examined 75% of all tenth graders in Chile's public schools, showed how a growth mindset promoted academic learning, while a fixed mindset hindered it; "a growth mindset is a comparably strong predictor of achievement and… exhibits a positive relationship with achievement across all of the socioeconomic strata" (p. 8664). Similar results in line with Dweck's theory have been found with smaller samples in the United States (Chen & Pajares, 2010), China (Zeng, Hou, & Peng, 2016), France (Cury, Fonseca, Zahn, & Elliot, 2008), and Greece (Mouratidis, Michou, & Vassiou, 2017). In contrast to a growth mindset, a fixed mindset "focuses individuals on avoiding demonstrations of inability" and "leads to decreased performance" (Cury et al., 2008, p. 789). The epistemological belief in scientific knowledge represents another interesting middle variable directly related to mindset, which in turn is directly related to science achievement as well as self-efficacy, and task-goal orientation (Chen & Pajares, 2010). These notions also supported Dweck's (2002) argument that "children's competence-related beliefs have their strongest direct effects on performance" (p. 108). Compared with examples outlined above, a study without any intermediate variable, such as the American study by Romero, Master, Paunesku, Dweck, and Gross (2014), illustrated the significantly positive role of a growth mindset in improving course grades in academic subjects. Earlier studies have also found a negative effect of fixed mindsets on achievement. For example, Heyman and Dweck (1998) found that American second graders' low achievement was related to "belief of trait stability," which might be regarded as a fixed mindset.

3.2. Mindset as a Mediator

Two studies have found that mindset also plays the role of mediator. In addition to the causal role, Claro et al. (2016) highlighted that mindset could play the role of mediator and link the relationship between socioeconomic strata and achievement. Specifically, students from lower-income families who had a growth mindset exhibited higher academic performance because a growth mindset "appreciably buffered against the deleterious effects of poverty on achievement" (p. 8664). In other words, students' mindsets might reinforce the impact of a structural situation on a systemic level, which in turn affects achievement. A Greek study indicated that mindset was found to moderate the week-to-week relation of autonomous functioning to study effort and homework procrastination; it also affected student well-being, such as subjective vitality, and feelings of depression and thereby had a direct influence on academic achievement (Mouratidis et al., 2017). For example, a fixed mindset demonstrated lower mean levels of study effort, higher amounts of homework, and poorer grades.

Consistent with Butler's (2000) conclusion, although the author did not men-

tion the relationship between mindset and academic achievement directly, students' mindset mediated "the effects of different kinds of information" (p. 974) on students' inferences about their ability level, including "moderating inferences from performance trends" and "the perceived diagnosticity of temporal versus normative feedback for self-appraisal."

3.3. Mindset as an Outcome

Students' mindset as an outcome means that students adopt and develop their mindsets as a result of their academic achievement. Although there is only one article to support this result, it deserves to be mentioned: a Greek study, by Gonida, Kiosseoglou, and Leondari (2006), which tested alternative models for mindset, perceived academic competence, and school achievement. Authors found that achievement determined the adoption of a particular mindset through the mediation of perceived competence. Specifically, the adoption of a particular mindset was found to depend on prior achievement level. For example, high achievers' mindset was significantly more incremental than that of medium and low achievers.

3.4. Mindset without an Evident Role

Interestingly, both French (Dupeyrat & Mariné, 2005) and Greek (Leondari et al., 2002) studies have emphasized that the correlation between mindset and achievement is not significant. By examining 76 French students enrolled in a special one-year program, Dupeyrat and Mariné (2005) amassed data suggesting that mastery goals have a positive influence on academic achievement, but mindset "on goal orientation and cognitive engagement in learning failed to emerge" (p. 43). Thus, this study did not support Dweck's theory on the role of mindset in academic achievement. In the Greek study, Leondari et al. (2002) highlighted "incremental beliefs were not related to academic achievement" (p. 287). An explanation might be that incremental beliefs influenced achievement indirectly through the adoption of a specific goal orientation. In other words, mindset was not likely to have any direct impact on achievement. In an American study, Robins and Pals (2002) analyzed Scholastic Assessment Test (SAT) scores and Grade Point Averages (GPAs) of 508 undergraduate students of the University of California at Berkeley, and found that students' perceived performance did not differ based on whether a student had a fixed or a growth mindset. Furthermore, students with different mindsets may have different academic abilities, which "did not translate into higher achievement" (p. 323).

In summary, based on the current research, students' mindsets play various roles in academic achievement. Most of the research reviewed here provides support for a causal role in line with Dweck's theory, although some studies indicate a mediator role. Studies have also indicated some contradictory results: Mindset might be an outcome of previous academic achievement, and it seems that in some cases, mindset might not have an impact on students' achievement.

4. The Role of Teachers' Mindsets in Students' Academic Achievement

Based on our review, the role of teachers' mindsets in student academic achievement (Table 2) will be discussed from two perspectives: teachers' mindset as a cause in students' academic achievement and teachers' mindset as a mediator in academic achievement.

4.1. Mindset as a Cause

Five articles (Table 2) were identified to support the role of teachers' mindset as a cause of students' academic achievement. By analyzing quantitative data collected from American seventh-grade science students (N = 160) and their two teachers, Schmidt, Shumow, and Kackar-Cam (2015) found that teachers played a critically important role in supporting classroom intervention. In this study, students participated in a Brainology intervention program, while teachers' classroom interaction was observed. The study found that Brainology had a positive, but short-term impact on students' academic achievement in science. The influence of the intervention was sustained over several months among students whose teacher adopted growth mindset language and messages in the classroom. However, for students whose teacher held a fixed mindset and delivered fixed mindset messages in the classroom, the impact of the intervention did not last, and students' achievement was even lowered. Interestingly, despite similarities in the teachers' stated beliefs, teachers' related pedagogical practices produced different effects on their students' mindsets and achievement. By comparison, by adopting quasi-experimental pre-, post- and follow-up mixed-methods to investigate 33 secondary-school pupils in Scotland, Donohoe, Topping, and Hannah (2012) found that Brainology intervention initially "encouraged a growth mindset in the pupils, supporting the pre-post results of previous studies" (p. 653). However, no significant difference was found one year later between the intervention and the comparison groups in terms of examination performance. In other words, follow-up revealed that this shift in mindset was not sustained, which in the light of the study by Schmidt et al. (2013) could be explained by the teachers' role.

By investigating 103 Finnish third- and sixth-graders and their teachers, Kärkkäinen, Räty, and Kasanen (2010) found that both the children's interpersonal and intrapersonal perceptions of their potential for improvement tended to be related to their teachers' perceptions. And the correlation between children's interpersonal perceptions and teachers' perceptions was stronger than the intrapersonal ones, which may result from the fact that "teacher-given normative feedback is valuable and visible at school and specifically significant to the perceptions of school-aged children" (p. 569). Moreover, the authors' later research (Kärkkäinen & Räty, 2010) spotlighted that teachers' perceptions of children's potential was less optimistic than that of parents in both the interpersonal and intrapersonal school subjects.

In predicting the use of praise among pre-service teachers, Jonsson and Beach

(2012) conducted two studies involving 176 and 151 pre-service teachers respectively, and demonstrated that the pre-service teachers' preferences for using praise were positively related to their mindset. Moreover, the praise was an important factor in predicting students' achievement. In particular, process praise had positive effects on learning, while person praise could have negative effects. By investigating 209 primary- and secondary-school teachers in the mid-western region of the United States, Shim, Cho, and Cassady (2013) confirmed that, although the effect of teachers' mindset about students' intelligence was meager, a significant connection between teachers' mindset and classroom performance structure was found to have an interactive effect. In other words, nurturing teachers' mastery goals for teaching is beneficial to develop a learning environment in which students could achieve maximum learning and intellectual growth.

4.2. Mindset as a Mediator

Two studies from Finland indicate that a teacher's mindset could moderate the relationship between parents' mindset and their child's academic potential. Based on ratings of teachers' and parents' evaluation of children's potential for improvement in mathematics and the Finnish language, Kärkkäinen and Räty (2010) illustrated that the more optimistic children's parents are, the higher the confidence their children have in their own abilities, and thus, the greater academic potential they will have. The researchers also addressed that there was a "moderate and positive correlation" between the teachers' and parents' ratings of children's potential. This result was consistent with earlier research demonstrating that teachers' mindset for children's potential was related to the mindset of a child's mother (Räty, Kasanen, & Kärkkäinen, 2006).

To summarize, although there is a limited amount of relevant research on teachers' mindsets in students' academic achievement, the available studies suggest that teachers' mindsets play the roles of both cause and mediator. And more studies find teachers' mindsets to be a causal factor than a mediator.

5. Discussion

This study reviewed current research to explore the role played by students' and teachers' mindsets in students' academic achievement. We reviewed the research on the relationship between mindset and academic achievement published from 1998 to 2017 and identified a total of 22 articles. We classified these into one of two categories based on the types of participants, and identified the role of mindset in students' academic achievement presented by respective authors.

Based on this review, it is evident that students' and teachers' mindsets are associated with students' academic achievement in various means. Specifically, students' mindsets play the roles of cause and mediator. Mindset can also be an outcome of students' academic achievement, while the roles played by teachers' mindsets were cause and mediator. It should also be emphasized that some studies found no link between mindset and achievement. Even though our review

indicates somewhat contradictory findings compared to Dweck's (2000) theory, the results nevertheless provide interesting points for future empirical, theoretical, and practical discussions about how mindsets are developed and how they affect students' learning.

The result suggests that students' mindsets are related to their academic performance and that their academic achievement can be affected by intervention. Furthermore, it appears that in measuring the long-term effect of the intervention, teachers' mindset-related messages play an important role in the classroom. The result implies that mindsets are responsive to learning and achievement. In terms of theoretical applications, in order to obtain greater insight into academic achievement, we suggest that future research should: 1) explore the specific process that influence direct or indirect links between mindset and academic achievement, and 2) construct a structural model that demonstrates as accurately as possible the relationships between mindset and achievement for both students and teachers. As for practical applications, we suggest that educators develop a positive environment for fostering students' mindsets and improving students' academic achievement with effective intervention.

The present study has several limitations. First, the present literature includes research that focuses on both mindset and academic achievement. However, research that focuses just on mindset or just on academic achievement could be synthesized to prove our conclusion, especially in studies involving the same variables. For example, Yeager, Trzesniewski, Tirri, Nokelainen, and Dweck (2011) discussed the negative role in attribution of a fixed mindset and the positive role of intervention in emotion with a growth mindset. Moreover, some of the studies reviewed (e.g., Cury et al., 2008; Zeng et al., 2016; Mouratidis et al., 2017) indicated that attributions and emotions were important mediators between mindset and achievement. Secondly, we excluded studies that were not written in English. This may result in the exclusion of valuable research in other languages. Thirdly, the measure of academic achievement in the present study is not strictly based on grades. In some of our research (Ahmavaara & Houston, 2007; Jonsson & Beach, 2012; Shim, Cho, & Cassady, 2013), the achievement outcome was not explicitly stated in the form of grade points, which may result in the ambiguity or the non-normalization of academic achievement to some extent.

Despite the potential limitations of the present review, it has considerable strengths. First, it represents the first review to discuss explicitly the role of students' and teachers' mindsets in student learning, which illustrates the direct and indirect relationships between mindset and academic achievement. Second, the review brings out for the first time the role of mindset in learning from three different perspectives—as cause, mediator, and outcome—and may shed light on another angle from which to enrich the research on mindset. Third, the study not only demonstrates the function of students' mindsets in learning, but also that of teachers' mindsets, thereby providing valuable resources for scholars and educators to examine teachers' classroom interaction and pedagogical thinking

from the view of mindsets in order to improve students' performance.

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Appendix. Coding Legend for Table 1 & Table 2

Identification criteria coding	
Grade	
E	Elementary School
M	Middle School
U/C	University/College
Collecting method	
I	Interview
O	Observation
Q	Questionnaire
S	Survey
SPM	Standard Progress Matrices
T	Test
Analysis method	
ANOVA	An Analysis of Variance
B-S-A	Between-Subjects Analysis
Chi-s A	Chi-square Analysis
DS	Descriptive Statistics
FA	Factor Analysis
HLM	Hierarchical Linear Model
PMA	Path Model Analysis
RA	Regression Analysis
SEM	Structural Equation Modeling
T-t	T-test

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Do First Impressions Count? Perceived Nonverbal Behaviors Associated with Social Acceptance in University Students

José Maria Montiel, Daniel Bartholomeu, Geraldo Antônio Fiamenghi Jr., Fabiano Gutierrez Franco, Gleiber Couto, Fernando Pessotto, João Carlos Caselli Messias

Nucleo de Pesquisa em Saúde e Desempenho Humano Centro Universitario FIEO, UNIFIEO/SP, Osasco, Brasil
Email: d_bartholomeu@yahoo.com.br

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Abstract

This study aims to analyze the relationship between non-verbal behavior of social interaction and acceptance and rejection in college, making sure that there are differences from beginning to end of the half as the acceptance and social rejection to study and do well as nonverbal behaviors evaluated at the beginning of the semester remains similar to the final acceptance and rejection in these assessments. They studied 175 college students of business schools (56.5%) and logistics of a large university in São Paulo, with 41% women. All of these students responded to the tests at the beginning and the end of June after signing the consent form. About 35% of the subjects were in the second year of their courses and students participated in the research first to seventh year of their courses. It developed a protocol in which it asks the student indicate a person who would like to study in the group and justify your choice from your perception of that person in nonverbal behaviors, namely, the look, voice content, voice quality, gestures hands, smile, body posture, tone of voice. In general, analyzing the behavior alone, they did not show differences in the perception of the beginning to the end of semester. However, how these were listed as reasons for the acceptance and social rejection to study and come out changed the beginning to the end of term, indicating that the coexistence of a semester enables a change in accepted motives and social rejection in the group.

Keywords

First Impressions, Nonverbal Behavior, Educational Psychology, College

1. Introduction

Latha (2014) believes communication to be the transference of information to

one person to another; as such, people spend 75% of their time in interpersonal communication, a significant part of which is nonverbal (body movements, eye contact, facial expressions). In fact, nonverbal communication refers to the transference of meanings through body language, space, time and paralinguistic elements, other than written or spoken language. Nonverbal communication is essentially less structured than verbal, non-linear, spontaneous and complementary to speech (Kouros & Cummings, 2011).

Personal appearance, including the way people dress, is one of the basis for first impressions, even before we introduce ourselves. Body posture, defined as the body position of the other, is different from gestures (the actual movements) and refers to how we place and keep our body, as well as the body fitness, related to feelings, personality traits such as trust, openness, or submission, and must correspond to context or situation's normal expectancy (Latha, 2014). Body gestures are movement performed with a member, especially the hands, to express, confirm, emphasize, or follow an attitude or intention. Gestures are signs of body language and are emblematic as the signs of good-bye, or the victory "V", for example. Facial expressions are also important nonverbal communication channels as they constantly change and are constantly monitored during communication. Eye movements involved in facial expressions are important aspects of nonverbal elements and the frequency of visual contact may suggest interest or boredom, or even suggest treason or deceit (Aviezer, Trope, & Todorov, 2012; Kouros & Cummings, 2011; Latha, 2014). About 93% of communications are nonverbal, being 38% attributed to nonverbal signs such as voice volume, pitch, speed, and 55% to visual contact (Gallo, 2007; Neuliep, 2003).

Part of those behaviors' processing is not conscious. While talking to someone, conscious thinking is alert to words and verbal communication to respond, as nonverbal elements are subconsciously processed. That is the way mirror neurons adapt in order to send information and to alert whether there is something wrong with the communication, as mirror neurons are involved in survival strategies, helping humans sharing knowledge, learning art, fights or compassion based in others' body language (Reiman, 2008).

Every time a person meets another one, a first impression is created, consisting in initial judgements based on nonverbal communication signs. Bierman & Wargo (1995) explain that Todorov and Willis' studies pioneered in revealing that an impression from a strange face takes a tenth of a second to be formed and prolonged exposure will not significantly alter those impressions (Mcaleer, Todorov, & Belin, 2014; North, Todorov, & Osherson, 2012; Stewart, Ajina, Getov, Bahrami, Todorov, & Rees, 2012). Based on that, the social preferences, confidence and wish to keep interactiong with people are defined. Actually, people make relatively precise assessment in less than one-minute observations and as such, people must prove themselves decent, genuine, and trustful via one tenth of a second nonverbal communication, otherwise the interaction might not persist (Kouros & Cummings, 2011).

Previously to verbal communication, human beings make judgements to as-

sure survival; in fact, accurate first impressions might be done to allow survival. Kouros and Cummings (2011) indicate a series of questions that must be answered to understand first impressions, such as why do we use first impressions and how do we do it; are they precise; are there people who perform better than others in first impressions do?

Many cognitive aspects are involved to facilitate specific ways of adjustment to social behaviors (Bartholomeu & Montiel, 2013). As social interactions evolved, new benefits and threatens appeared and early cognitive detection alert against possible damages. Cummings (2011) suggests that first impressions tend to be more negative, as primarily the basic psychological mechanisms might be related with danger detection, that are neutralized when potentially hazardous intentions are inferred. Therefore, negative impressions persist even with contradictory information, and positive impressions require more evidence and can even be reverted to negative with additional information (Bartholomeu, Carvalho, Silva, Miguel, & Machado, 2011). The tendency to form simple and quick first impressions is instinctive and consequently, individual differences are difficult to establish (Ambady & Skowronski, 2008). People who are more precise in developing first impressions are less prone to depressive symptoms, less social anxiety, and shyness; they also are more socially competent, opened to experiences, confident, more expressive, and communicative. Another feature is empathy, as they are more capable to establish precise peers' body language, as well as considered sources of advice and safety, warm, compassionate, less hostile and less rebellious (Ambady & Skowronski, 2008; Blake, Kim & Lease, 2011; Funder & Harris, 1986; Kudesia & Elfenbein, 2013). It is interesting to observe that the ability of forming first impressions is not correlated to inteligence, but with nonverbal communication knowledge, related to social intelligence (Borod, Pick, Hall, Sliwinski, Madigan, Obler, Welkowitz, Canino, Erhan, Goral, Morrison, & Tabert, 2000; Davitz, 1964; Davis & Kraus, 1997).

Kraus, Oveis, Allison, Young, Tauer and Keltner (2014) examined group hierarchy and suggested that subjects acquire respect and admiration when involved in behaviors that affect others' judgements related to group values. Tetlock (1983) observed that people's attribution is affected by pressures in justifying impressions and decrease the primary effects of subjects' first perception, affecting the way people decode and process information. Dockrell and McShane (2000) analyzed the effects of nonverbal cues and first impressions in interviews, and results showed a significant interaction between the kind of interview and nonverbal cues, especially in non-structured interviews.

Studies focusing on impressions and nonverbal behaviors are more frequent in business and marketing (Kudesia & Elfenbein, 2013), but more restrict in Education (Ames, 2008; Greenfield & Quiroz, 2013; Titkova, Ivaniushina, & Alexandrov, 2013; Wentzel, 2009). No studies relating nonverbal behaviors to sociometry (social acceptance and rejection in school) were identified, as well as studies investigating the consistence of first impressions in school contexts, and university students.

Following the assumptions previously described, this study aimed to verify the relations between acceptance and rejection in university students based on non-verbal behavior, since they have a strong impact on the formation of first impressions in social relations. Thus, we tried to compare the impressions formed at the beginning and end of the semester regarding acceptance and rejection to study and leave university students.

2. Method

2.1. Participants

The sample consisted of 175 students, female (41%) and male (59%) enrolled in business administration (56.5%) and logistic courses at a São Paulo (Brazil) Metropolitan area University, assessed at the beginning and the end of term. Participants came from first to 7th periods of their courses.

The choice of these classes was due to the fact that they attended a common core discipline taught at the university, in which students of different grades participated and they did not attend the same rooms before entering this discipline. This course was taught in two classes containing 80 and 95 students, respectively.

2.2. Instruments

Checklist of Nonverbal Behaviors

This measure seeks to capture the acceptance or rejection of a student by his or her peers. For this, it was first requested that each participant nominate a colleague who would choose to study. The participant should justify his/her response from the perception of the person chosen in non-verbal behaviors, such as the look, voice content, voice quality, hand gestures, smile, body posture, tone of voice (Caballo, 2000). Each behavior was rated on a scale of 1 to 5, with "1" being a perception of that behavior as being inappropriate and "5" adequate. This procedure was applied to the positive choices, that is, acceptance to estuar and leaving and negative, namely, rejection in these same situations.

2.3. Procedures

Students responded to the "Checklist of Nonverbal Behaviors" at the beginning of the semester, when they did not know each other yet. After 6 months, the procedure was repeated with the same participants. Each application lasted an average of 20 minutes.

3. Results and Discussion

Firstly, results from the protocols at the beginning of the term and its end in terms of acceptance and rejection to "study with" and "hang out with" were compared. The analyzes were carried out in the software Statistical Package for Social Sciences (SPSS), version 20. Table 1 shows descriptive statistics for the acceptance situation of "study with".

Table 1. Nonverbal behaviors predictive of acceptance to "study with" (beginning of term).

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
22	(Constant)	0780	0336		2.324	0021		
	Posture	0258	0087	0262	2.974	0003	0591	1.692
	Gesture	−0204	0096	−0199	−2.118	0035	0519	1.926
	Speed	0182	0078	0194	2.345	0020	0669	1.495
	Content	0181	0094	0181	1.934	0055	0527	1.898
	Personal Attention	−0147	0081	−0173	−1.810	0072	0502	1.994

[a]Dependent Variable: acceptance-studying with

Source: Prepared by the authors.

There were no significant differences in the responses' means of each indicator pretest and posttest, except rejection to "study with", showing more rejection after 6 months. Hence, the answer to "*Do first impressions count?*" seem to be "yes", as every behavior considered by the participants at the beginning of the term were stable after some months of contact. Results are in accordance to literature, as other studies also showed initial perceptions to be stable in time (Bierman & Wargo, 1995; Mcaleer, Todorov, & Belin, 2014; North, Todorov, & Osherson, 2012; Stewart et al., 2012). In addition, rejection being more observed agrees to literature, as evolutionary psychological mechanisms are involved with alert and danger detection (Bartholomeu & Montiel, 2013). The increase of rejection after six months may be explained by the fact that negative impressions are more persistent, even when receiving contradictory information, and positive impressions can be easily transformed in negative ones, when new information appear (Kouros & Cummings, 2011).

However, measure dispersion was high, and correlations between pretest and posttest variables were low, leading to the possibility that many people were not classified in the same way as their classmates, as well as that not all participants who were accepted in pretest had the same assessment in posttest, despite similar means. Thus, a model was created, including measures of nonverbal behavior and acceptance and rejection in the beginning and end of term, to investigate whether the same behaviors would be associated to acceptance and rejection to "study with" and "hang out with" in the beginning (when people did not know each other) and after a period of contact. Analysis employed nonverbal behaviors classified in each period (term beginning and end) as independent variables and acceptance and rejection to "study with" and "hang out with" as dependent variables, using the backward method to insert variables into the model.

Concerning acceptance to "study with" in the beginning of the term, the final statistic significant model included variables posture, gestures, speech speed and content. The observed tendency suggests that a better posture, as well as speech

speed and adequate content are associated to acceptance to study with; too many gestures were negatively associated to that variable (F(5, 192) = 4.89; p = 0.000). Acceptance to study with at the end of term was not significantly associated to any nonverbal behavior (F(5, 192) = 2.059; p = 0.093). Therefore, acceptance to study with tended to be associated to a first impression of posture, defined by Latha (2014) as position and maintenance of the body in front of the other, as well as its physical structure, related to personality traits such as trustfulness, openness, or submission. Speech speed and adequate content were also paralinguistic elements related to acceptance in first impression (Greenfield & Quiroz, 2013; Latha, 2014; Titkova, Ivaniushina, & Alexandrov, 2013).

Concerning rejection to "study with" in the beginning of the term, significant variables were speech volume, duration and content; the more adequate the volume and content, the less rejection to "study with" and the higher the speech duration, more rejection was observed (F(5, 192) = 4.72; p = 0.003). At the end of the term, orientation, personal appearance, intonation, speech time and fluent were significant (F(5, 192) = 5.52; p = 0.000).

It seems that, as people meet, paralinguistic elements tended to associate to rejection to "study with" and as interpersonal contact increases, other paralinguistic elements are observed as relevant, such as speech duration, as well as other behavioral features such as orientation and appearance were likely to reduce rejection (Table 2). Apparently, the amount of information gathered with

Table 2. Nonverbal behaviors predictive to rejection to study with at the beginning of the term and at its end.

Beginning of Term								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
24	(Constant)	4.244	0500		8.493	0000		
	Speech Volume	−.361	0172	−0160	−2.094	0038	0800	1.251
	Speech Duration	.407	0234	0175	1.743	0083	0466	2.147
	Content	−.632	0237	−0260	−2.670	0008	0494	2.022
End of Term								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
21	(Constant)	4.826	0.572		8.436	0000		
	Gaze	−0430	0231	−0241	−1.863	0066	0492	2.034
	Orientation	−0598	0240	−0323	−2.496	0014	0492	2.032
	Gestures	0857	0225	0489	3.810	0000	0501	1.998
	Intonation	0628	0279	0383	2.251	0027	0285	3.509
	Fluence	−0585	0263	−0345	−2.223	0029	0342	2.924
	Speech duration	−0625	0269	−0362	−2.320	0023	0340	2.945

Source: Prepared by the authors.

contact and more detailed observation of nonverbal behaviors tended to include new elements as justifications for social rejection to "study with" (Kouros & Cummings, 2011).

Acceptance to "hang out with" was significantly related to smile and speech content in the beginning of the ($F(5, 192) = 6.20$; $p = 0.000$), as more interesting content minimized the acceptance to hang out with, and smiles tended to increase that acceptance. At the end of the term, significant behaviors were distance, physical proximity, speech volume ($F(5, 192) = 3.40$; $p = 0.003$). Paralinguistic elements tended to reduce acceptance to "hang out with", despite being observed as adequate (**Table 3**). While initially smile tended to be associated to acceptance to "hang out with", after some months, physical proximity was more significant. Perhaps paralinguistic elements are picked and used in building first negative impressions, when compared to visual elements (Kouros & Cummings, 2011).

Concerning rejection to "hang out with" in the beginning of the term, the only significant variable was smiles ($F(5, 192) = 11.41$; $p = 0.001$), meaning that the

Table 3. Nonverbal behaviors predictive to acceptance to "hang out with" in the beginning of the term and at its end.

Beginning of Term								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
24	(Constant)	1.250	0.352		3.549	0000		
	Smiles	0191	0075	0187	2.543	0012	0866	1.155
	Personal Appearance	0134	0075	0133	1.785	0076	0834	1.198
	Content	−0230	0068	−0248	−3.407	0001	0878	1.139
End of Term								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
20	(Constant)	2.026	0.354		5.719	0.000		
	Gaze	0169	0096	0220	1.764	0.081	0581	1.722
	Distance/ Physical Contact	0232	0091	0346	2.554	0.012	0491	2.035
	Distance/ Physical Contact post	−0152	0084	−0224	−1.809	0.074	0588	1.699
	Voice Volume post	−0224	0098	−0296	−2.291	0.024	0541	1.850
	Clarity post	−0232	0124	−0326	−1.867	0.065	0296	3.383
	Clarity post	0238	0116	0333	2.045	0.044	0341	2.931
	Content post	−0218	0120	−0274	−1.821	0.072	0399	2.506

Source: Prepared by the authors.

perception of adequate smiles tend to reduce rejection to "hang out with". At the end of the term, facial expression, gaze and personal attraction were significantly associated with rejection to "hang out with" ($F(5, 192) = 9.34$; $p = 0.001$).

It may be observed that variables that explained acceptance and rejection in the beginning of the term, did not sustain at the end of the term. Thus, although the means of the same assessments being constant for the same subjects, the covariation of those variables (nonverbal behavior and social acceptance and rejection) is not the same in the beginning of the term and at its end. Those results indicate that other aspects such as personality, human values, or other group variables may be involved (Kraus, Oveis, Allison, Young, Tauer, & Keltner, 2014; Blake, Kim, & Lease, 2011; Kudesia & Elfenbein, 2013; Funder & Harris, 1986; Ambady & Skowronski, 2008). There is a possibility that the first imppression keeps constant at the end of the term, but only resignified based in new perceptions of nonverbal behaviors due to more contac and interaction (Kouros & Cummings, 2011).

Another analysis was conducted to identify nonverbal behaviors observed in the beginning of the term that could explain acceptance and rejection at the end of the term, and allow for some predictive power of those behaviors in the beginning, to minimize social rejection and maximize acceptance (**Table 4**). Concerning rejection to "hang out with" at the end of the term, facial expression, personal attention and response to questions in the beginning were significantly associated ($F(5, 192) = 4.96$; $p = 0.004$). Results indicate that more agreeable facial expressions and more adequate answers to questions in the beginning of the term, when people did not know each one very well, tended to reduce rejection to "hang out with" after six months of contact. Personal attention, although ade-

Table 4. Nonverbal behaviors predictive of rejection to "hang out with" in the beginning of the term and at its end.

Beginning of Term								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
26	(Constant)	3.095	0.317		9.762	0000		
	Smiles	−0398	0118	−0239	−3.379	0001	1.000	1.000
End of Term								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
24	(Constant)	3.406	0.361		9.434	0000		
	Facial Expression	−0581	0204	−0474	−2.841	0006	0329	3.035
	Gaze	0393	0191	0319	2.060	0043	0382	2.619
	Personal Attention	−0390	0142	−0306	−2.753	0007	0741	1.350

Source: Prepared by the authors.

quately detected, was associated to rejection to "hang out with" at the end of the term. In fact, perception and building of impressions based in facial expressions tend to be sustained for a longer period, according to other studies (Mcaleer, Todorov, & Belin, 2014; North, Todorov, & Osherson, 2012; Stewart et al., 2012).

Regarding "hang out with" after six months of daily contact, behaviors in the beginning of the term were facial expression, smile, posture, intonation, clarity and speech duration ($F(6, 84) = 4.49$; $p = 0.001$). Acceptance to "hang out with" at the end of the term was reduced by facial expression, clarity and speech duration, considered adequate in the beginning of the term, and increased with perception of smiles, posture and intonation (**Table 5**).

Rejection to "study with" at the end of the term was explained by orientation, speech volume and clarity in the beginning of the term ($F(5, 71) = 5.44$; $p = 0.000$). Orientation and volume were negatively related to rejection to "study with", minimizing it after six months of contact and speech clarity tended to increase rejection. Finally, acceptance to "study with" at the end of term, was explained by pitch and speed ($F(2, 87) = 4.37$; $p = 0.017$); pitch reduced acceptance and speed increased it, after six months of contact.

Final Considerations

There were no differences in behaviors in the beginning of the term and at its end, when independently analyzed. However, the way they were ranked as explanations to social acceptance and rejection to "study with" and to "hang out with" changed from the beginning of the term to its end, indicating that contact during term allows for a change in the motives to social acceptance and rejection within the group. There is also the possibility that difference be mediated by individual or group values, which are incorporating in daily contact and affect the ways people justify their choices, despite their perceptions still being the same.

A more detailed analysis of the outliers of the regression can be performed to also identify people whose perceptions have been changed from the beginning to the end of the semester, namely that were accepted at the beginning and they were not the end of the semester or rejected at the beginning and not the end of the semester, since the identification of the characteristics of these people can provide a better insight into the aspects that mediated the change in perception of first impressions.

This work addresses the topic from how accepted and rejected people are perceived by their peers and further research could compare methods to see which one best explains the variability of acceptance and social rejection in the group, whether they are nonverbal behaviors assessed by the perception of pairs or social skills and emotional characteristics assessed by self report.

Among other limitations in this study, we can mention the loss that occurred pre and post test, since not all subjects were in the room at the second time of collection. At the same time, the research took place in a common core of discipline and would be worth taking rooms separately per course to examine the profile of these subjects per course, since the culture of each of these groups

Table 5. Nonverbal behaviors in the beginning of the term predictive of social acceptance and rejection to "study with" and "hang out with" at the end of the term.

Rejection to "Hang Out With"								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
24	(Constant)	3.082	0.429		7.180	0000		
	Facial Expression	−0386	0152	−0404	−2.532	0014	0491	2.038
	Personal Atention	0572	0229	0481	2.495	0015	0337	2.966
	Answers to Questions	−0497	0209	−0402	−2.372	0021	0437	2.289
Acceptance to "Hang Out With"								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
21	(Constant)	1.349	0.247		5.452	0000		
	Facial Expression	−0184	0079	−0332	−2.321	0023	0466	2.145
	Smiles	0238	0093	0403	2.555	0013	0383	2.609
	Posture	0167	0082	0291	2.025	0046	0463	2.161
	Intonation	−0195	0092	−0359	−2.116	0037	0331	3.020
	Clarity	−0228	0090	−0438	−2.548	0013	0323	3.098
	Speech Duration	0227	0091	0444	2.502	0014	0302	3.310
Rejection to "Study With"								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
22	(Constant)	3.716	0.612		6.070	0000		
	Posture	0438	0239	0284	1.830	0072	0446	2.244
	Orientation	−0993	0272	−0615	−3.654	0001	0379	2.641
	Personal Appearance	0427	0250	0231	1.707	0092	0587	1.703
	Speech Volume	−0744	0268	−0482	−2.770	0007	0354	2.822
	Clarity	0464	0204	0332	2.278	0026	0506	1.978
Acceptance to "Study With"								
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
25	(Constant)	1.741	0.350		4.976	0000		
	Pitch	−0378	0139	−0430	−2.723	0008	0428	2.338
	Speed	0404	0144	0444	2.814	0006	0428	2.338

Source: Prepared by the authors.

would be different and could tell more about what circumstances the selection of certain nonverbal behaviors as predictors of acceptance and rejection occur.

It should be emphasized that no significant differences were found in the perception of nonverbal behaviors between the female and male participants. Although some authors (Bartholomeu, Montiel, & Pessotto, 2011; Montiel, Pessotto, & Bartholomeu, 2014) observed differences between the sexes, the result of the present research may be related to the fact of the differences between self-reported behaviors and based on nonverbal behaviors. However, an in-depth discussion of these data is beyond the scope of this study.

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Features of Interpersonal Cognition in People with High Interpersonal Sensitivity and Privileged Self: Personality Features of "Modern-Type" Depression

Shinji Sakamoto, Masaki Muranaka, Itsuki Yamakawa

Department of Psychology, College of Humanities and Sciences, Nihon University, Tokyo, Japan
Email: sakamoto.shinji@nihon-u.ac.jp

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Abstract

Since the 1990s, "modern-type" depression (MTD), which has different features from melancholic depression, has been reported and has become a mental health problem in Japan. Although psychological studies of MTD are very limited, previous studies have proposed Interpersonal Sensitivity (IS) and Privileged Self (PS) as personality features of MTD. IS and PS are measured by the Interpersonal Sensitivity/Privileged Self Scale (IPS), and the present study examined correlations of IPS scores with several personality scales to clarify the interpersonal cognition tendencies of people with high IS and PS. A total of 439 Japanese undergraduates participated in the study, answering several questionnaires including the IPS. Results showed that people with high IS scores were inclined to be concerned with how they were seen by others, tended to take notice of others, and had a weaker sense of independent self, but a stronger sense of interdependent self. These characteristics are thought to be common in anxiety as well as melancholic depression. People with high PS scores were more likely to disregard others and showed higher tendencies to dogmatism and a diffuse/avoidant identity style, which may be unique in MTD.

Keywords

Depression, Interpersonal Sensitivity, Personality, Self-Consciousness, Interpersonal Influence

1. Introduction

1.1. "Modern-Type" Depression in Japan

In Japan, psychiatrists have proposed two contrasting subtypes of depression:

traditional-type depression (TTD) and "modern-type" depression (MTD; e.g., Kato et al., 2011). TTD is depression with melancholic features according to the DSM-IV (American Psychiatric Association, 2013), and is considered to be prototypical depression. On the other hand, some Japanese psychiatrists have indicated the existence of MTD, which differs from TTD (**Table 1**; see also Kato et al., 2016). MTD has been reported in Japan especially from 1990, and is now reported to be observed in other Asian countries or regions (e.g., Korea, Taiwan), Australia, and the United States (Kato et al., 2011). Although MTD is not recognized as a formal diagnosis in Japan, psychiatrists and psychologists are beginning to study MTD empirically (e.g., Sakamoto, Yamakawa, & Muranaka, 2016), and diagnostic criteria for MTD have been proposed by Kato et al. (2016).

1.2. Individual Differences in MTD: Interpersonal Sensitivity (IS) and Privileged Self (PS)

As stated above, MTD has attracted attention from Japanese people and become a mental health problem in Japan (e.g., Mori, 2012a, 2012b); thus, psychological studies examining the onset of MTD are needed. Although psychological theories of depression already exist (e.g., Abramson, Alloy, & Metalsky, 1990), these theories implicitly assume that depression is of the melancholic type. Thus, a

Table 1. A comparison of melancholic depression and "modern-type" depression in Japan.

	Melancholic depression (Traditional-type depression: TTD)	"Modern-type" depression (MTD)
Ages	Middle age (born before 1970)	Young age (born after 1970)
Characters	Attachment to rules	Attachment to self separately from social roles
	Love of order, models	Distress over rules/order
	Sympathetic	Negative feelings toward order or model
	Obsessive	Vague sense of omnipotence
	Honest	Not hard worker to begin with
	Hard worker	
Symptoms	Agitation or retardation	Fatigue and not feeling good enough
	Exhaustion and guilt	Avoidance and blame of others
	Well-prepared suicide	Impulsive suicidal action
Therapeutic relationship	Resist diagnosis of depression	Cooperate with diagnosis of depression
	When recovered, learn from experience of depression	Tend to self-check depressive symptoms
		Have difficulty departing from diagnosis (prefer to stay in "depression")
Drug response	Usually good	Partial response
	Complete remission	
Cognition	Obtaining a new sense of role (e.g., self as a manager to self as a manager who has experienced depression)	Have difficulty departing from "I suffer from depression"
Prognosis	Good response to rest and antidepressants	Become chronically ill only with rest and antidepressants
	Ambivalent about change of environment	Change of environment rapidly improves symptoms

Note. With reference to Tarumi (2005), Tarumi & Kanba (2005), and Kato et al. (2011).

new theory is needed to explain MTD, which has different features to melancholic depression; Sakamoto, Yamakawa, and Muranaka (2014) proposed a new psychological theory attempting to explain the onset of MTD. According to this theory, a certain type of personality interacts with interpersonal stressors (i.e., negative evaluations from others), which then produces depressive symptoms similar to MTD. We describe the theory briefly below.

Under this theory, the personality type that was assumed to engender MTD was specified on the basis of the authors' previous study (Muranaka, Yamakawa, & Sakamoto, 2015), and the features of this personality type were labeled "Interpersonal Sensitivity" and "Privileged Self." Interpersonal Sensitivity (IS) is defined as subsuming both of the following two characteristics: (a) a tendency to be excessively worried about others' negative evaluations, and (b) a tendency to excessively react (i.e., overreact) to such negative evaluations. People with high IS tend to be shocked and become depressed after receiving negative evaluations from others who have significant influence over them. People with high IS may be likely to be influenced by negative evaluations from others and feel depressed as a result. For example, when making mistakes at work, high-IS office workers are more likely to be worried about negative evaluations from their superiors and colleagues, which make them feel depressed. Such tendencies may be seen in both MTD and TTD.

However, MTD and TTD differ in Privileged Self (PS), which is defined as a tendency to pursue one's own pleasure at the expense of maintaining harmony with others. Consider the aforementioned office workers who make mistakes at work and feel depressed. If such workers are high in PS, they are strongly motivated to lessen their unpleasant experiences (i.e., the negative evaluations from others and the depressed mood) at the expense of maintaining harmony with their superiors and colleagues. Thus, they may contradict or blame the people who evaluated them negatively, and may be absent from the office in order to distract themselves from the office work which made them feel depressed. In contrast, if such office workers are low in PS, they may think that harmony with others is more important than pursuing their own pleasure. Thus, they may make efforts to reverse the negative evaluations of others; if they are successful in doing so, their depressed mood will lessen. Otherwise, they may blame themselves and apologize for not performing well; presenting self-blame is sometimes used in Japan as a means of solving interpersonal conflict, and such behavior may also improve others' evaluations of them. This kind of behaviors (i.e., making additional effort or engaging in self-blame) are typically seen in the case of TTD.

Although Sakamoto et al.'s theory may show promise in explaining the onset of MTD, the scale that measures IS and PS has only recently been developed (Muranaka, Yamakawa, & Sakamoto, 2017; Yamakawa, Muranaka, & Sakamoto, 2015), and empirical studies of the theory are anticipated.

1.3. The Purpose of the Present Study

IS and PS are measured by the Interpersonal Sensitivity/Privileged Self Scale

(IPS; Muranaka et al., 2017; Yamakawa et al., 2015). As the reliability and validity of the IPS have already been reported (Muranaka et al., 2017; Yamakawa et al., 2015), in the present study we use this scale to examine the interpersonal characteristics of persons with high IS and PS.

In examining their interpersonal characteristics, we consider three separate aspects of cognition. In interpersonal situations, a person interacts with others, and may often consider how he/she is seen by others, especially when the others are important to him/her. Thus, the first aspect considered is self-consciousness. Subsequently, once interpersonal influences take hold between the person and others, the person may come to consider the relationship between the self and others. Thus, the second and third aspects are cognition about others in relation to the self, and cognition about the self in relation to others. For the first aspect, we examine correlations between IPS scores and the Interpersonal Sensitivity Measure (Boyce & Parker, 1989), Public Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975), and Self-Preoccupation Scale (Sakamoto, 1998). For the second aspect, we examine correlations between IPS scores and the Assumed-Competence Scale (Hayamizu, Kino, Takagi, & Tan, 2004). Finally, for the third aspect, we examine correlations between IPS scores and the Takata Independent/Interdependent Self-Construal Scale (Takata, Omoto, & Seike, 1996) and the Identity Style Inventory (Berzonsky, 1989).

As anti-depressants are somewhat ineffective in treating MTD (**Table 1**), methods of prevention and intervention drawing on psychological perspectives are needed. In planning such methods, knowledge of the interpersonal characteristics of persons with IS and PS is important, because these traits are thought to interact with interpersonal stressors to engender MTD (Sakamoto et al., 2014). Thus, in the present study, we administered several scales along with the IPS to test a number of correlational hypotheses.

1.4. Hypotheses about IS

Regarding the first aspect of interpersonal cognition investigated here, self-consciousness, people with high IS are thought to be generally nervous about interpersonal relations, which predicts a positive correlation with scores on the existing scale of interpersonal sensitivity, the Interpersonal Sensitivity Measure. People high in IS are also thought to be concerned about their public self, the self that is observable by others. Thus, IS scores were expected to correlate positively with scores on the Public Self-consciousness Scale. It is noteworthy that public self-consciousness reflects the *tendency* to focus on public aspects of the self, but not the *duration* of such self-focused attention. As some researchers have pointed out (Ingram, 1990; Sakamoto, 1998), it is the duration of self-focused attention that plays a more important role in the maintenance of depressive symptoms. Thus, in explaining the onset of MTD, the duration of self-focused attention also needs to be considered; we predicted a positive correlation between IS and the Self-Preoccupation Scale, which reflects the duration of self-focused attention.

For the second aspect of cognition, cognition about others in relation to the self, we predicted a negative correlation between IS and the Assumed-Competence Scale, which measures the degree to which a person disregards others. People high in IS may be more influenced by others, which suggests that they have high regard for others. Thus, we expected a negative correlation between IS and the Assumed-Competence Scale.

For the third aspect of cognition, cognition about the self in relation to others, we examined the correlation between IS and the Takata Independent/Interdependent Self-Construal Scale. Takata's scale measures independent and interdependent self-construal separately; the former is measured with "individuality" and "dogmatism" subscales, and the latter is measured with "depending on others" and "evaluative apprehension" subscales. People who are high in IS may be inclined to pay attention to evaluations from others; thus, a positive correlation may be found between IS and the evaluative apprehension subscale of the Interdependent Self-Construal Scale. In collectivistic countries such as Japan, concealing one's own attitudes and conforming with others is one way to build good relationships with others and obtain more positive evaluations from them. Conversely, people in collectivistic countries are likely to refrain from clearly stating and affirming their opinions. Such behaviors are more likely to be seen in high-IS people, as they are sensitive to others' estimations of them. Thus, we expected positive correlations between IS and the depending on others subscale of interdependent self-construal, and negative correlations between IS and the two independent self-construal subscales.

1.5. Hypotheses about PS

Privileged Self (PS), defined as a tendency to pursue one's own pleasure at the expense of maintaining harmony with others, also produces an effect on interpersonal processes. Although we had no hypothesis relating PS and self-consciousness, we did form hypotheses relating PS to the second and third aspects of cognition investigated. With respect to cognition about others in relation to the self, people with high PS are thought to disregard others, by the following reasoning. When negative evaluations are received from others (e.g., the person makes a mistake at work and receives negative evaluations from colleagues) and this event lowers self-esteem, people may be motivated to restore their self-esteem, and can do so in at least two ways: one is to make an effort (e.g., by working harder) to obtain positive evaluations from others, and the other is to disregard those with negative evaluations of them (e.g., by disregarding colleagues and believing themselves instead). Because the former approach requires effort and is onerous, people high in PS are more likely to take the latter approach; we predicted a positive correlation between PS and the Assumed-Competence Scale.

Regarding cognition about the self in relation to others, we first examined the correlation between PS and the Takata Independent/Interdependent Self-construal Scale. We predicted positive correlations between this scale and PS. Specifically, as stated above, people with high PS are likely to restore self-esteem by

disregarding others, which predicts a positive correlation between PS and the dogmatism subscale of independent self-construal. People with high PS can also restore self-esteem by concluding that they are so unique that others cannot understand them, which predicts a positive correlation between PS and the individuality subscale of independent self-construal. We predicted a negative correlation between PS and the depending on others subscale of interdependent self-construal, because people high in PS pursue their own pleasure at the expense of maintaining harmony with others. No hypothesis about the relationship between PS and the evaluative apprehension subscale of interdependent self-construal was formed.

PS scores may also exhibit a relationship with identity formation. Berzonsky (1989) stressed the problem-solving and decision-making aspects of identity formation, and proposed three identity styles: Information Orientation, Normative Orientation, and Diffuse Orientation. Of the three identity styles, PS may be related to the Diffuse Orientation, because a person with high PS may avoid or procrastinate facing up to negative information about him/herself in order to maintain a high self-evaluation, which is similar to the behavioral characteristics of the Diffuse Orientation style.

2. Method

2.1. Participants and Procedure

Participants were 439 Japanese undergraduates enrolled in an introductory psychology course (332 male, 104 female, 3 undeclared). Participants completed the questionnaires during a lecture period. We considered that completing all seven questionnaires (131 items) would be undesirable, because completing all items, some of which were similar, would be onerous for the participants, possibly affecting response accuracy, and because the lecture period's duration was insufficient to ensure that all participants would be able to complete all the items in a timely manner. Accordingly, we compiled several different questionnaire batteries and administered them to separate samples. Specifically, 137 (75 male, 62 female) participants completed the Public Self-Consciousness Scale, the Self-Preoccupation Scale, the Takata Independent/Interdependent Self-Construal Scale, and the IPS; 96 (74 male, 19 female, 3 unknown) participants completed the Assumed-Competence Scale, the Identity Style Scale, and the IPS; and 206 participants (183 male, 23 female) participants completed the Interpersonal Sensitivity Measure and the IPS.

2.2. Measures

The Interpersonal Sensitivity/Privileged Self Scale (IPS; Muranaka et al., 2017; Yamakawa et al., 2015) was developed to measure the personality features of individuals with MTD, and is assumed to indicate vulnerability factors for MTD. It consists of 25 items divided into two subscales, Interpersonal Sensitivity (IS: 16 items) and Privileged Self (PS: 9 items). Examples of IS items are "I worry that I may be criticized for my words and actions" and "I am able to quickly move on

even if I'm criticized by those around me" (reverse item). Examples of PS items are "I can't stand people who don't accept my opinion" and "I think my problems are caused by circumstances and people around me." Each item is rated on a 5-point scale ranging from 1 (very unlike me) to 5 (very like me).

We used the Japanese version (Kuwabara, Sakado, Uehara, Sakado, & Someya, 1999) of the Interpersonal Sensitivity Measure (IPSM; Boyce & Parker, 1989). Although this version contains 36 items, we omitted three items that overlapped with the items of IPS, and thus used 33 items. Examples of IPSM items are "I feel insecure when I say goodbye to people" and "I do not like people to really know me." Participants answered each item on a 4-point scale ranging from 1 (very unlike me) to 4 (very like me).

The Public Self-Consciousness Scale (PSC) is a subscale of the Self-Consciousness Scale (Fenigstein et al., 1975). We used the PSC extracted from the Japanese version of the Self-Consciousness Scale (Oshimi, Watanabe, & Ishikawa, 1985). Examples of PSC items are "Before I leave my house, I check how I look" and "I'm self-conscious about the way I look." The PSC consists of nine items, which are rated from 1 (does not apply to me at all) to 5 (applies to me very well).

The Self-Preoccupation Scale (SPS; Sakamoto, 1998) measures both self-focused attention and how prolonged it is, and consists of 11 items. Its focus is limited to private aspects of the self, such as character, memory, feeling, ability, and the ideal self. Examples of SPS items are "Once I start thinking about myself, I find it difficult to stop" and "I often analyze myself for long periods of time." Each item is rated on 5-point scale from 1 (does not apply to me at all) to 5 (applies to me very well).

The Assumed-Competence Scale, second version (ACS; Hayamizu et al., 2004) consists of 11 items. Each item is a statement that inquires as to the extent to which the participant undervalues others. Examples of the items are "Looking at the way others work, I feel that they are insufficient" and "Looking at the way others work, I feel that they are inefficient." Participants answer using a 5-point scale ranging from 1 (I never think so) to 5 (I often think so).

In the Takata Independent/Interdependent Self-Construal Scale (Takata et al., 1996), the Independent and Interdependent Self-Construal scales consist of 10 items each. The former is composed of "individuality" (4 items) and "dogmatism" (6 items) subscales, and the latter is composed of "depending on others" (6 items) and "evaluative apprehension" (4 items) subscales. Example items are as follows: "I always state my own opinions clearly" (individuality), "It doesn't bother me if my idea or behavior differs from that of others around me" (dogmatism), "How I feel about things depends on who I am with or the situation I am in" (depending on others), and "I am concerned with what others think of me" (depending on others). Participants answer each item on a 7-point scale ranging from 1 (does not apply to me at all) to 7 (applies to me very well).

We used the Japanese version (Niimi, Maeda, & Kato, 2005) of the Identity Style Inventory (ISI; Berzonsky, 1989), which was developed by translating the

original version (Berzonsky, 1989) and making to some changes to apply to Japanese undergraduates. This completed version consisted of three subscales (23 items): Informational style (9 items), Normative style (5 items), and Diffuse/Avoidant style (9 items). An example of a Diffuse/Avoidant style item is "I'm not really thinking about my future now and it's still a long way off." Each item was rated on 5-point scale ranging from 1 (does not apply to me at all) to 5 (applies to me very well).

2.3. Ethical Considerations

Ethical approval for the present study was obtained from the university institutional review board. Participants were informed orally as well as on paper that participation in the study was voluntary, that their answers to the questionnaires were anonymous, that they were able to stop responding at any time they wished to, and that participation in the study did not affect their grade. If participants consented to this arrangement, they proceeded to answer the questionnaires. Otherwise, they were able to submit the questionnaires without answering them.

3. Results

3.1. IS Hypothesis Testing (Table 2)

In examining participants' interpersonal characteristics, we separated these into three aspects of interpersonal cognition. Regarding self-consciousness, we hypothesized that IS would be significantly correlated with scores on the IPSM, PSC, and SPS, which was supported by correlation analyses. That is, we obtained significant correlations of IS with IPSM (r = .67, p < .001), PSC (r = .60, p < .001), and SPS (r = .57, p < .001) after controlling for PS. We also examined cognition about others in relation to the self. We hypothesized that IS would be negatively correlated with ASC scores, which measured the disregarding of others. Correlational analysis showed that PS and ASC were negatively correlated (r = –.23, p = .024); thus, the hypothesis was supported. In regard to cognition about the self in relation to others, we predicted a positive correlation between IS and two interdependent self-construal subscales; after controlling for PS, the correlations of IS with evaluative apprehension and depending on others were r = .81 (p < .001) and r = .37 (p < .001) respectively. We also predicted that a negative correlation would be observed between IS and two independent self-construal subscales; after controlling for PS, the correlations of IS with individuality and dogmatism were r = –.55, p < .001 and r = –.51, p < .001, respectively. Thus, all hypotheses relating to IS were supported.

3.2. PS Hypothesis Testing (Table 2)

Of the three aspects of interpersonal cognition investigated, we examined the second and third in relation to PS. The hypothesis for cognition about others in relation to the self was that PS would be positively correlated with ACS scores, which was supported: the correlation between PS and ACS was r = .58, p < .001,

Table 2. Number of data points, alpha coefficients, means, and *SD*s for each scale, and partial correlations with IS and PS.

	N	α	*M*	*SD*	Partial correlations with IS		Partial correlations with PS	
					r	*p*	*r*	*p*
Self-consciousness								
Interpersonal Sensitivity Measure (IPSM)	206	.88	81.18	13.14	.67	<.001	−.06	.415
Public Self-Consciousness Scale (PSC)	138	.80	33.84	5.78	.60	<.001	.05	.562
Self-Preoccupation Scale (SPS)	138	.88	35.11	8.71	.57	<.001	.26	.002
Others in relation to self								
Assumed-Competence Scale, 2nd ver. (ASC)	96	.84	30.01	7.49	−.23	.024	.58	< .001
Self in relation to others								
Interdependent Self-Construal Scale								
Depending on others	138	.61	31.38	4.38	.37	<.001	−.08	.339
Evaluative apprehension	138	.81	20.32	4.70	.81	<.001	.09	.318
Independent Self-Construal Scale								
Individuality	138	.66	16.35	3.99	−.55	<.001	.13	.122
Dogmatism	138	.71	24.41	5.46	−.51	<.001	.23	.007
The Identity Style Inventory (ISI)								
Informational Style	96	.70	33.07	4.73	−.11	.291	−.07	.513
Normative Style	96	.35	14.98	2.66	−.15	.155	.17	.101
Diffuse/Avoidant Style	96	.76	22.60	5.39	.12	.240	.22	.029

Mean, *SD*, and alpha coefficients of the scales are presented in the table. Because the two subscales of the IPS (that is, IS and PS) were significantly correlated with each other in each sample (r = .23 - .46), we calculated partial correlations between each of these subscales and the other scales administered by controlling for the other IPS subscale.

after controlling for IS. In regard to cognition about the self in relation to others, we hypothesized positive correlations between PS and two independent self-construal subscales. Although the predicted correlation with the individuality subscale was not significant (r = .13, p = .122), the correlation with dogmatism was significant (r = .23, p = .007) after controlling for IS. We also predicted a positive correlation between PS and the Diffuse/Avoidant orientation of the ISI, which was supported (r = .22, p = .029) after controlling for IS.

4. Discussion

The present study aimed to clarify the interpersonal characteristics of those who score highly on the IPS. Considering three aspects of the interpersonal process, we examined the correlations between the IPS and various scales. Generally speaking, our hypotheses were supported.

4.1. IS Findings

Regarding self-consciousness, we hypothesized positive correlations of IS with

scores on the IPSM, PSC, and SPS, and obtained results that supported these hypotheses. Because the correlations were rather strong (r = .57 - .67), we can conclude that persons who are high in IS are concerned with the public self, and engage in prolonged self-focused attention. Similarly, as to cognition about others in relation to the self and the self in relation to others, our hypotheses were also supported. That is, IS was negatively correlated with scores on the ACS and two subscales of independent self-construal, and was positively correlated with two subscales of interdependent self-construal. It is noteworthy that the size of the correlation (after controlling for PS) between IS and dogmatism was almost equal to that of the correlation between IS and individualism (r = –.55 and r = –.51, respectively).

Although interpersonal sensitivity is thought to have a relationship with both MTD and TTD, these characteristics may also be linked to psychological features of anxiety. For example, anxiety is positively correlated with self-focused attention (Mor & Winquist, 2002, for a review) and the ACS (Suzuki & Hayamizu, 2015), and is also negatively correlated with independent self-construal (e.g., Moscovitch, Hofmann, & Litz, 2005; Takata, 1999). Thus, further studies are needed to clarify the relationships among interpersonal sensitivity, anxiety, TTD, and MTD.

4.2. PS Findings

With regard to the prediction for cognition about others in relation to the self, we predicted a positive correlation between PS and ASC, and obtained results that supported this hypothesis. People with high PS may disregard others, intentionally or unintentionally, in order to restore their damaged self-evaluation. In connection with cognition about the self in relation to others, we predicted positive correlations between PS and two subscales of the independent self-construal scale, and a negative correlation between PS and the depending on others subscale of the interdependent self-construal scale. A significant correlation was found only between PS and the dogmatism subscale of independent self-construal. We also predicted a positive correlation of PS with scores for the Diffuse/Avoidant style of ISI, and obtained results supporting this hypothesis.

These results may be interpreted as follows. When people receive negative evaluations from others, and recognize a gap between this and their own positive evaluation of themselves, one response is to believe themselves and assert their own belief. If others are persuaded and accept their view, their evaluations by others are restored. However, as the negative correlation between PS and individuality shows, people with high PS are unlikely to engage in such a strategy. Rather, the positive correlations of PS with dogmatism as well as ACS may suggest that people with high PS disregard others' views and regard themselves as right in a self-satisfied manner. As discussed above, this evidence is corroborated by the positive correlation between PS and the Diffuse/Avoidant identity style. As people with high PS avoid or procrastinate facing negative information about themselves, their self-esteem becomes vulnerable; people who are high in PS do

not have confidence in themselves. These interpersonal behaviors are characteristic of people with MTD, and not of those with TTD. Thus, in contrast to IS, which may be related both to MTD and to TTD, PS may relate uniquely to MTD.

4.3. Limitations

The present study has several limitations. First, this study used a Japanese sample. As cultural background may influence the onset of MTD, replication in other countries is necessary. Second, strong correlations of IS with scores on the IPSM, PSC, and SPS suggest some overlap between IS and other scales. Research discriminating between IS and traits measured by other scales is needed. Third, since the sample consisted of college students not diagnosed with depression, we do not know whether similar results would be obtained in clinical samples. Despite these limitations, our hypotheses about IS and PS were almost completely supported, and the validity of the IPS was demonstrated.

4.4. Conclusion

This study has demonstrated several characteristics of people with high IS and PS, which are personality traits thought to interact with interpersonal stressors to engender MTD. The characteristics of people with high IS can be summarized as follows: 1) they are inclined to be concerned with how they are seen by others, 2) they tend to take notice of others, and 3) they have less sense of independent self, but more sense of interdependent self. On the other hand, the characteristics of people with high PS can be summarized as follows: 1) they have a disposition to disregard others, 2) they are somewhat dogmatic, and 3) they tend to have a Diffuse/Avoidant identity style. A challenge for future research will be to demonstrate causal relationships between these personality traits (i.e., IS and PS), interpersonal stressors, and depression using a longitudinal design.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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Down Syndrome Cognitive Constraints to Recognize Negative Emotion Face Information: Eye Tracking Correlates

Ernesto Octavio Lopez-Ramirez[1], Guadalupe Elizabeth Morales-Martinez[2], Yanko Norberto Mezquita-Hoyos[3], Daniel Velasco Moreno[2]

[1]Cognitive Science Laboratory, Department of Psychology, Nuevo Leon Autonomous University (UANL), Monterrey, Mexico
[2]Cognitive Science Laboratory, Institute of Research on the University and Education, National Autonomous University of Mexico (UNAM; IISUE), Mexico City, Mexico
[3]Department of Psychology, Yucatan Autonomous University (UADY), Merida, Mexico
Email: elopez42@att.net.mx, gemoramar@hotmail.com

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Abstract

Eye gaze correlates to emotion face recognition were obtained from a sample with Down syndrome (DS) as well as from a sample of typical individuals to look for gaze pattern differences between both. The goal was to determine if possible face scanning patterns might be related to different styles of cognitive automatic processing of emotion faces information. First, after IQ control, participants were required to take an affective priming study. This emotion recognition studies allowed appropriate selection of DS showing typical negative face recognition difficulties. Then, both samples took a formative eye tracking study in order to identify gaze correlates typifying them. Results showed that participants with DS have atypical eye fixation patterns regarding emotion faces recognition. In particular, they seem to intentionally avoid fixating on the eyes of presented photographs of emotion faces. This face scanning patterns might contribute to their difficulties to recognize negative face information. It is argued that this kind of cognitive processing of emotion facial information obeys to an acquired affective style.

Keywords

Down Syndrome, Emotional Facial Recognition, Eye Tracking Correlates, Affective Priming Paradigm

1. Introduction

Our ability to recognize facial expressions of emotion like a happy face or an angry one as well as the capacity to discriminate them from neutral expressions be-

gins to develop early in life (around 4 to 9 months of age; Williams, Wishart, Pitcairn, & Willis, 2005). Increment in facial recognition expertise seems to be related to general aspects of cognitive and perceptual development (Mondloch, Maurer, & Ahola, 2006). Then, in recent years emerged an interest to explore effects of atypical cognitive development condition on facial recognition abilities (see Morales & Lopez, 2013). For example, several studies showed that most people with Down syndrome (PWDS) (see Wishart & Pitcairn, 2000; Pitcairn & Wishart, 2000), autism (for review see Turk & Cornish, 1998; Uljarevic & Hamilton, 2012; Weigelt, Koldewyn, & Kanwisher, 2012), Williams syndrome (e.g., Porter, Coltheart, & Langdon, 2007; Plesa-Swerer, Faja, Schofield, Verbalis, & Tager-Flusberg, 2006) present difficulties to recognize some kinds of emotional facial expressions.

Since recognizing emotional faces have a relevant influence on social relationships establishment and maintenance (Williams et al., 2005), low accuracy in this ability prevents people to take on opportunities to establish pro-social interactions and to avoid potential social dangers (e.g. Marsh, Kozak, & Ambady, 2007). Persons with difficulties to recognize negative emotions linked to social disapproval (e.g., fear, angry) may experience segregation or discrimination. For instance, many PWDS has difficulties to keep proper social distance from others (frequently they approach too close) (e.g., Porter et al., 2007), which makes them prone to social discrimination. This behavior has been related to facial information recognition difficulties. For example, regarding emotion face recognition studies, DS children do present lower recognition accuracy scores than those obtained with typical children and children and adolescents with intellectual disabilities having the same mental age (Williams, Wishart, Pitcairn, & Willis, 2005; Wishart, Cebula, Willis, & Pitcairn, 2007). These difficulties arise in particular with the emotions of fear and surprise (Wishart & Pitcairn, 2000). Complementary research suggests the possibility for a DS specific cognitive information processing style tuned to discriminate negative faces from other emotion faces (Conrad, Schmidt, Niccols, Polak, Riniolo, & Burack, 2007; Morales & Lopez, 2010; Morales, Lopez, Castro, Charles, & Mezquita, 2014).

Recently, a set of affective priming studies were carried over to explore PWDS' affective style to recognize emotion face information. First, participants' abilities to identify and categorize emotion were identified (Morales & Lopez, 2010, Morales et al., 2014), then familiarity effects over emotion face recognition were explored (Morales & Lopez, 2010). Finally, their affective style to recognize emotion face information was determined (configural vs. analytic) (Morales, 2010). Generally speaking, these results showed that: a) As it is the case regarding typical individuals, DS study participants showed different styles to emotion face recognition. Interestingly, negative face recognition difficulties were not a characteristic typifying all DS study participants. Furthermore, the capacity shown by some PWDS to correctly categorize negative face emotions did not extend to all spectra of negative information. Here, for some DS study participants was harder to recognize angry and fear emotions (specially over female faces) and for

other participants the categorization of faces showing sadness (Morales et al., 2014), b) PWDS seem to process differently positive familiar faces from unfamiliar positive faces and c) a configural face recognition style typifies most of DS study samples as it is the case over typical adults (e.g., Shimamura, Ross, & Bennett, 2006).

In a set of face recognition neuro computational studies regarding DS face stimuli and typical population faces (Morales & Lopez, 2011) it was observed that implicit emotion face information facilitated 80% accurate recognition of typical faces and around 70% of DS emotion faces. This lead to the question about if DS negative face recognition difficulties might be related to specific gaze patterns of implicit face information. Thus a follow up eye tracking study in addition to the appointed emotion face recognition reaction studies can be implemented to explore this unknown answer. Eye tracking studies typifying gaze patterns of people with intellectual disabilities have been carried on providing insightful information. For example, Hedley, Young and Brewer (2012), found that people having Autism present different difficulties when considering explicit versus implicit emotion face information. It is not known if similar results can be found in a DS population.

This study aims to explore the implicit affective facial recognition by using eye tracking correlates such that a specific eye scanning pattern to evaluate facial information should typify PWDS as different from a typical population. Schurgin and colleagues (2014) have shown that typical individuals primarily pay more attention to salient facial features (like eyes, nose and mouth) than on other facial regions, but spend more time looking at the mouth when recognizing happy faces and more time on the eyes for angry, sad and fearful faces. If this emotion face recogniton pattern applies to PWDS remains unknown. Moreover, it is assumed that DS emotion face scanning patterns to negative face information must agree with a failure to detect distinct characteristics of negative face information (e.g. no fixation time over eyes and eyebrows). To explore this, the following experimental procedures were implemented.

2. Method

Since a robust amount of academic evidence suggests that persons with DS have some facial emotion recognition difficulties (for a review see Morales & Lopez, 2013) it is expected from a formative eye tracker study to immediately detect gaze typification to this population. Thus, this study intention seeks for an immediate qualitative identification of face recognition differences between DS and typical participants rather than a summative analysis to inference. However, as it will be discussed later, by finding some empirical evidence of gaze patterns typifying DS negative face recognition, relevant theoretical insights on DS emotion face recognition difficulties are expected.

In order to accomplish this research goal both samples were required to take an affective priming as well as to participate in an eye tracking study. The affective priming study was a control to assure that typical participants were capable

of differential automatic processing recognition of valenced face stimuli (Musch & Klauer, 2003) whereas DS participants were not capable of cognitive automatic processing of negative face stimuli (Morales et al., 2014).

2.1. Participants

According to Pernice and Nielsen (2009), 30 to 32 participants are needed to produce a "stable" heatmap that represents the gaze behaviors of all users in a study. However, as it has been pointed out by Bojko (2013) whenever the average likelihood of problem detection in a formative study is high (problem discoverability) then the required sample size is low. **Table 1** shows the relation between sample size and the probability of detecting the problem being searched (Sauro & Lewis, 2012).

Thus, by considering **Table 1** we expected at least to have a 90% chance to find Down syndrome specific gaze patterns and we included an initial sample of ten young PWDS. However, after IQ testing control only two individuals were taken into account for the affective priming study and the eye tracker study. The final scrutiny to compare both samples into the formative eye tracker study consider two typical female participants (out of eight) whose age ranged between 21 to 22 years old and two PWDS (out of ten participants), a 17 years old female and a 25 years old male.

Psychometric Control

Wechsler scales (WAIS-IV) were used to test participants' IQ. Moreover, an instrument was developed (Multidimensional Assessment of Emotion—I: MAE-1) to capture demographic information (age, gender, health, etc.), mood history (possible emotional disorders, current mood states, most frequent mood state), and measurement of emotion dimensions (conceptualization, experience, self-regulation, and perceived emotion, as well as face recognition capacities: emotion naming, emotion identification, emotion discrimination, etc.).

Table 1. Sample size specification according to a consideration of problem discoverability (Based on Sauro & Lewis, 2012).

Sample size	Problem Discoverability (p)						
	0.01	0.05	0.1	0.15	0.25	0.5	0.9
n = 1	0.01	0.05	0.1	0.15	0.25	0.5	0.9
n = 2	0.02	0.1	0.19	0.28	0.44	0.75	0.99
n = 3	0.03	0.14	0.27	0.39	0.58	0.88	1
n = 4	0.04	0.19	0.34	0.48	0.68	0.94	1
n = 5	0.05	0.23	0.41	0.56	0.76	0.97	1
n = 6	0.06	0.26	0.47	0.62	0.82	0.98	1
n = 7	0.07	0.3	0.52	0.68	0.87	0.99	1
n = 8	0.08	0.34	0.57	0.73	0.9	1	1
n = 9	0.09	0.37	0.61	0.77	0.92	1	1
n = 10	0.1	0.4	0.65	0.8	0.94	1	1

Here, the DS male presented an IQ score of 60 whereas the DS female an IQ score of 61. Several efforts to test they had attention capacity for both studies were carried on. Regarding, the first typical participant she obtained an IQ score of 120 whereas the second typical female obtained a score of 104.

2.2. Instruments and Stimuli

2.2.1. The Affective Priming Study

The selected affective prime face stimuli were arranged in pairs (prime-target) to create 135 experimental trials. Each trial presented the two faces consecutively, and stimulus onset asynchrony (SOA) was controlled (the time interval considering the beginning of the presentation of the first stimulus up to the beginning of the presentation of the second stimulus. In addition, the inter-stimulus interval (ISI; time between both stimuli) was controlled. Manipulation of the ISI and the SOA induces either cognitive automatic processing or controlled processing. In this study, both temporal parameters were set to activate automatic processing. The experimental trials were presented on a computer using the software Super Lab Pro 5. Figure 1 illustrates visually this experimental manipulation.

2.2.2. The Eye Tracking Study

To register eye movements, we used a RED 500 Hz tracking system, SMI SensoMotoric Instruments. Both eyes were recorded. Regarding the control group (typical individuals) only eye data of correctly recognized emotions were analyzed whereas for the experimental group the experimental task was considered only a gaze capture mechanism. Distance from floor to participants' eyes ranged between 43.30 to 55.11 inches with a standalone RED eye tracker having a 20-degree visual angle having a 15 inches distance from a 21" wide screen monitor. Before beginning the eye-tracking experiment, participants completed a calibration procedure by using the SensoMotoric iView 2.8 system to ensure the eye-tracker was adequately tracking gaze. In this calibration procedure, all participants were asked to follow a flashing dot as it appeared at 5 locations. If calibration was unsuccessful, the monitor and chair were adjusted until proper calibration was achieved.

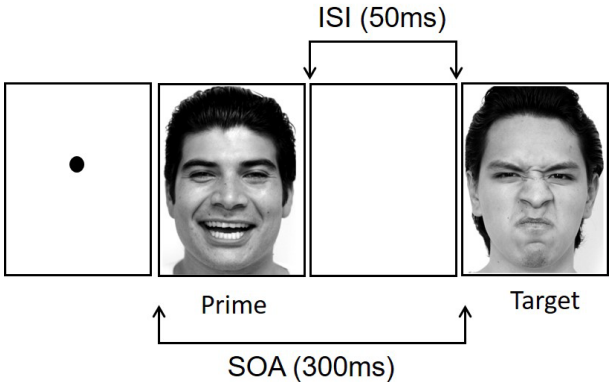


Figure 1. Illustration of an affective priming experimental trial.

Following calibration, participants were presented with a practice block consisting of 10 face emotion images (five female and five male faces). Then, five experimental blocks each containing twenty different female and male emotion faces displaying happy, fearful, angry, surprise and neutral expressions were presented once in a randomized order. Faces were shown for 4500 milliseconds each, with a 350 milliseconds inter-stimulus interval in which the screen was blank white. This kind of eye tracking technique methods are proved to be reliable to cognitive specification (Duchowsky, 2007; Luna, Marek, Larsen, Tervo, & Chahal, 2015; Eckstein, Guerra, Singley, & Bunge, 2016).

3. Results

For typical participants' data to be included in the analysis, they should have had at least 90% of correct hits. Here, a within ANOVA was carried on over a three experimental conditions data (Positive words, negative words and neutral faces). As expected a significant main effect was obtained for the stimuli valence factor $F(2, 2) = 65{,}29$, $p = 0.01$ (see **Figure 2**).

Also as expected, DS participants presented a recognition difficulty to negative facial information. **Figure 3** shows the case for the DS female participant.

Figure 4 and **Figure 5** show eye fixation times from both samples through heat maps. Rather than presenting averaged facial stimuli metrics both figures present some positive and negative faces from the experimental blocks to favor qualitative scrutiny.

Notice from **Figure 5** that DS eye fixation (compared to typical population) in average did not concentrate on face salient characteristic regarding negative emotions (like fixation on eyes or eyebrows). They seem to be interested on face gesticulation surrounding the nose (upper lips area, nasolabial folds and the nose). This is especially true for DS2.

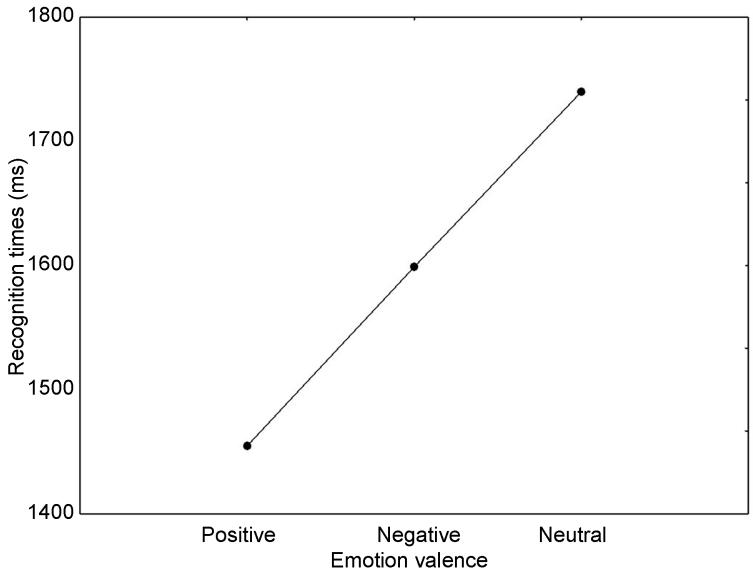
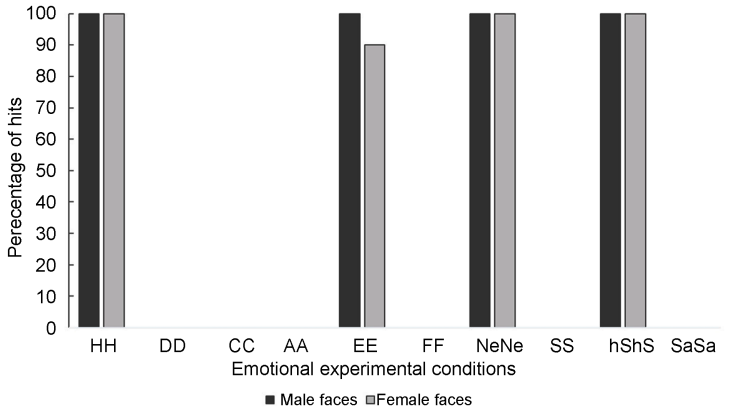


Figure 2. Typical study participants showed a significant main effect to recognition of emotion discrimination of face information.



HH	DD	CC	AA	EE	FF	NeNe	SS	hShS	SaSa
Happiness	Disgust	Contempt	Angry	Euphoria	Fear	Neutral	Surprise	Happy Surprise	Sadness

Figure 3. Negative face recognition difficulty presented by a DS female participant.

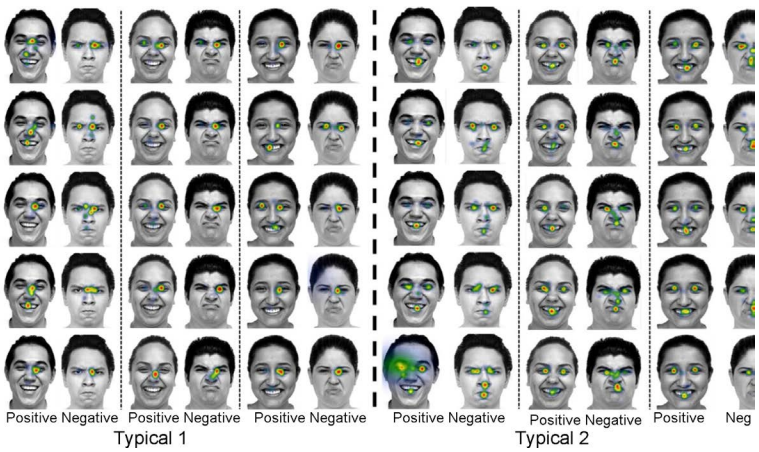


Figure 4. Typical participants' recognition of salient facial features (like eyes, nose and mouth). If fixation times are averaged then typical participants spend more time looking at the mouth when recognizing happy faces as well as more time on the eyes for angry, sad and fearful faces.

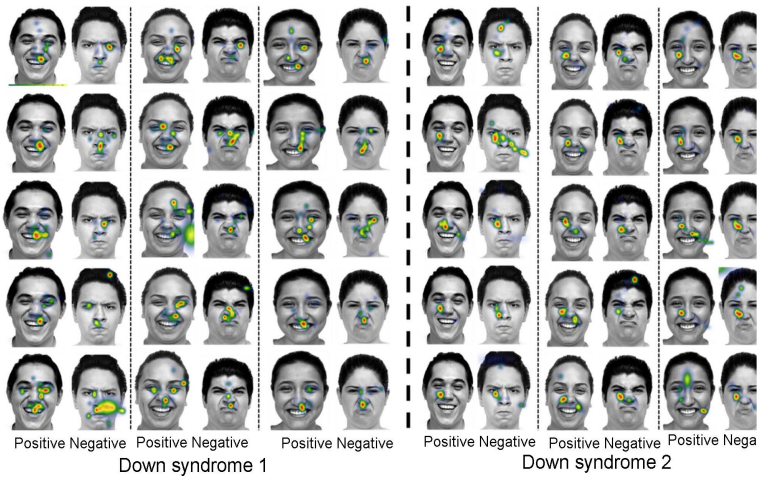


Figure 5. Male DS eye fixation time (DS1) compared to a DS female eye fixation pattern through different emotion face stimuli (DS2).

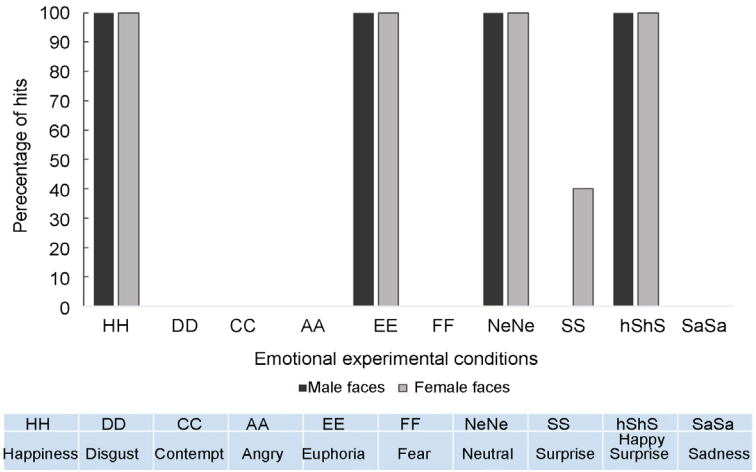


Figure 6. In contrast to the female DS participant this DS male individual recognized negative valenced surprise.

Overall, these results show distinctive eye fixation patterns between both sample studies. No distinctive or significant differences to DS eye fixation regarding positive or negative could be observed.

4. Discussion

In this study we sought to explore eye gaze patterns typifying DS emotion face recognition as different from typical individuals. In accordance to previous affective priming studies dealing with automatic processing of emotion face information studies (Morales et al., 2014; Morales & Lopez, 2013; Morales & Lopez, 2010), DS participants showed lower accuracy to categorize negative face information when compared to typical individuals' emotion face recognition accuracy. Furthermore, different gaze patterns to static photographs of emotion faces were obtained from both samples (DS vs typical).

Overall, the experimental group emphasized eye fixation over nasolabial fold and regions nearby the nose. This eye gaze pattern is similar to the appointed by Farsin and colleagues (Farsin, Rivera, & Hessl, 2009). These authors reported an eye tracking study dealing with Fragile X Syndrome (FXS) individual's capacity to recognize emotion face stimuli. Their study participants exhibited atypical fixation patterns to pictures of emotion faces; they specially avoided looking at eyes. They imply that these effects might extend to glaze avoidance in real-life situation. From the current study results the same speculation can be derived since DS participants seemed to deliberately avoid looking at the eyes of static photographs of faces.

Furthermore, the DS male behaved rather differently than the DS female participant. He recognized some negative valenced information in the affective priming study and her eye fixation was also different than the female counterpart. This opens exploration to look for DS gender preferences over emotion faces or to determine if possible female\male emotion recognition depend on particular affective processing.

It is worth to notice that even when DS gaze patterns to positive and negative face information are atypical, they had no trouble recognizing positive face stimuli. Here, they seem to achieve positive face recognition by eye fixation over the upper lips area and nasolabial fold face information (see **Figure 5** and **Figure 6**). Negative face recognition difficulties might not apply to the information recognition of happiness since physiology to both kind of emotions seems to be different (Blair, Morris, Frith, Perrett, & Dolan, 1999).

This formative study represents an example on how eye tracker studies help to explore cognitive emotional processing of people having intellectual disabilities. Consider the possibility to deepen our understanding into DS people who recognize negative face information from those PWDS who does not by using eye gaze metrics. If so, then a possibility to explore if they develop a cognitive filter to avoid eye contact to favor positive bias toward others. Cognitive specification of such cognitive emotion style is needed. Similar procedures used in this paper can be used for this purpose (also Luna et al., 2015; Eckstein et al., 2016).

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The Effects of Self-Focused Attention on Mood: Differences of Self-Aspect Valence while Self-Focusing

Rie Tabuchi[1], Asami Yamazaki[2], Megumi Oikawa[2]

[1]The United Graduate School of Education, Tokyo Gakugei University, Tokyo, Japan
[2]Faculty of Education, Tokyo Gakugei University, Tokyo, Japan
Email: r162002p@st.u-gakugei.ac.jp

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Abstract

Self-focused attention is a primary risk factor for depression in adolescents. Previous studies have suggested that sustained self-focus ultimately leads to depression. However, in recent years, it has been suggested that focusing on all aspects of the self, both positive and negative, has a positive effect on mental health. Hence, in this study, we aimed to explore adaptive self-focusing and examined the effects on mood following manipulation of the self-aspect (*i.e.*, both positive and negative aspects of self, only positive, and only negative). Eighty-eight Japanese undergraduate and graduate students participated in the experiment. Results suggest that focusing on both positive and negative aspects of the self does not amplify depressed mood. Furthermore, this type of self-focus also does not decrease positive mood, and exhibits the same adaptive effects on mood as focusing only on positive aspects of the self.

Keywords

Self-Focused Attention, Depressed Mood, Positive Mood, Self-Aspect

1. Introduction

In adolescence, mental disorders, such as major depressive disorder, anxiety disorder, and schizophrenia are more likely to develop or manifest (Sawazaki & Matsubara, 1988). Previous studies have reported that university students in late adolescence are often highly depressed (Tomoda, Mori, Kimura, Takahashi, & Kitamura, 2000; Garlow, Rosenberg, Moore, Haas, Koestner, Hendin, & Nemeroff, 2008). For instance, approximately 70% of Japanese university students display depression greater than or equal to mild, and approximately 10% demonstrate the same degree of depression as found in severely depressed patients

(Murayama & Okayasu, 2012). Therefore, prevention of depression that targets adolescents has become an urgent issue, and thus, preventive interventions have begun to be developed (Peden, Rayens, Hall, & Beebe, 2001; Oikawa & Sakamoto, 2008).

Self-focused attention is one of the possible risk factors of depression in adolescents. Self-focused attention is both the state of paying attention to oneself, and the personality trait of an individual that tends to readily pay attention to him/herself (Sakamoto, 1997). Establishment of ego identity is an important developmental task in adolescence. As such, this developmental task presents individuals more opportunities to think about who they are, and what kind of person they would like to be. Therefore, self-focused attention increases (Sakamoto, 1997; Kosaka, 2009).

According to Self-awareness Theory (Duval & Wicklund, 1972), an individual evaluates him/herself by comparing the ideal self with the actual self. This reflection occurs, not surprisingly, in a state where attention is focused on the self. Young people tend to be especially conscious of the gap between ideal and actual self, and are also more likely to focus on negative aspects of the self. Thus, self-focused attention is often negative, resulting in increases of depression and anxiety (Sakamoto, 1997). It has been reported that university students tend to engage in negative self-focusing (Murayama & Okayasu, 2012). In previous studies related to depression, it has been considered effective to limit sustained self-focus, as this leads to depression (see review Nolen-Hoeksema & Morrow, 1993; Sakamoto, 1993). However, to establish identity, it is necessary for an individual to reflect upon who they are in order to acquire the confidence that he/she is developing a personality that can be clearly positioned in social reality (Erikson, 1959). To think about themselves and to wonder what kind of person they are in society are important tasks that cannot be avoided for young people. Therefore, it is essential to provide support for adaptive self-focused attention that does not lead to depression to prevent the occurrence of this mental health issue in late adolescence.

Some studies in university students have demonstrated that the higher tendency to resist examining negative aspects of the self, the higher feelings of self-disgust, while there was no relationship between the amount of opportunities of self-focusing and the amount of self-disgust (Satoh & Ochial, 1995). From these results, Satoh & Ochiai (1995) also suggested that the extent to which negative feelings toward the self are experienced is not related to the amount of opportunities of self-focusing, but rather, how an individual engages with the self (*i.e.*, whether the individual thinks about the negative parts of the self). Additionally, the more deeply an individual looks at the self, based on both positive and negative aspects, the lower the feelings of inferiority, although a higher tendency to distract oneself from the negative aspects, the higher feelings of inferiority (Kosaka, 2009). Furthermore, Mizuma (2003) has pointed out that the turning point of whether individuals fall into depression, or participate in self-formation when experiencing negative events is to look directly at the nega-

tive aspects of the self and view it as a problem. These findings suggest that, in adolescence, it is important to consider which aspect of the self to focus upon for self-focusing to become adaptive, and that focusing on both positive and negative aspects is necessary.

The study focused on two dimensions of the self (positive/negative) when self-focusing, as it has been suggested that individuals who pay attention to both sides when self-focusing do not demonstrate decreases in self-evaluation, even if attention to the negative aspects of the self continues (Harada, 2006). Additionally, it has been suggested that attention paid to both the positive and negative aspects of the self provides a buffer from the depression that typically results from only a negative self-focus (Kumada & Oikawa, 2015). These findings suggest that it is possible to adaptively engage in self-focusing, without increasing depressed mood, by combining attention to both the negative and positive aspects when self-focusing. However, the aforementioned studies primarily utilized survey methodology. As such, empirical studies on the effects of attention to both sides of the self on mood are still insufficient. Thus, in the current study, we aimed to explore adaptive self-focusing and experimentally examined the effects of manipulation of the target aspect of the self when self-focusing on mood.

2. Methods

2.1. Participants

The experimenter explained the outline of this study in university classrooms and asked for those who were willing to participate. The sample of this study consisted of 88 Japanese undergraduate and graduate students (41 men and 47 women). The mean age was 20.81 (SD = 1.53). All participants belonged to the same university.

2.2. Measures

2.2.1. Depressed Mood and Positive Mood

The Depression and Anxiety Mood Scale (DAMS; Fukui, 1997) consists of three subscales: depressed mood, anxious mood, and positive mood. In this study, only depressed mood and positive mood were used. Depressed mood is comprised of three items "depressed," "disgusted," and "dark," while positive mood is characterized by "fun," "active," and "happy." The degree of each item is rated on a seven-point Likert type scale (i.e., 1 = *not at all* to 7 = very *applicable*). The DAMS has demonstrated sufficient reliability, convergence validity, and discriminative validity (Fukui, 1997).

2.2.2. Private Self-Awareness

To ascertain whether the subjects' attention was focused on themselves during the self-focus task, the Private Self-awareness Scale was used as an operation check. This scale aims to measure the state of private self-awareness, and is comprised of 9 items (e.g., "I was trying to understand what kind of person I

was," "I focused attention on my true feelings"). The degree of each item is rated on a seven-point Likert type scale (*i.e.*, 1 = *not at all* to 7 = *very applicable*). Reliability of this scale has been shown to be adequate and internal consistency has been supported (Sakamoto, 1993).

2.3. Self-Focus Task

The manipulation of self-focus conducted in previous study (Sakamoto, 1993) was utilized in the current study. The manipulation of self-focus (Sakamoto, 1993) is aimed at inducing thought about one's own inner personality, and is composed in a style similar to the "Who Am I?" test (Kuhn & McPartland, 1954; Furusawa & Hoshino, 1962). Specifically, the manipulation is a task to describe 10 different answers to the question "What kind of person am I?" for 6 minutes. To raise the attention to the private self, answers are restricted to contents concerning one's own inner characteristics, and it is instructed that participants should not to answer about external aspects (e.g., appearance, clothes, etc.) or social aspects (e.g., blood relations, affiliations, etc.). In other words, this task is a method for individuals to ask themselves "What kind of person am I as a whole?" through the completion of 10 different answers.

In the present study, the operation of the valence of self-aspect in self-focus was added to the manipulation utilized by Sakamoto (1993), and the three conditions were set: both-aspects group (focus on both positive and negative aspects of the self), positive group (only on positive aspects of the self), and negative group (only negative aspects of the self). The subjects in the both-aspects group were asked to complete sentences such as "I like my _____" and "I do not like my _____," alternately. The subjects in positive group completed only sentences of "I like my _____," and subjects in negative group completed only sentences of "I do not like my_____." To maintain self-focus for 6 minutes, it is instructed to keep thinking about "What kind of person am I?" until the end of the experiment, even after completing all sentences.

2.4. Distraction Task

For ethical reasons, the distraction task was introduced so as not to sustain the subjects' negative moods after the experiment. We conducted a "connect the dots" puzzle as a distraction task. The puzzle used in this study asked participants complete a flower picture by connecting points, numbered 1 to 93, in order, and with straight lines. A time limit was not set, allowing for the task to be completed at the pace of each subject.

2.5. Study Procedure

Participants were randomly assigned to three conditions, which were different in the self-aspect focused upon during the self-focusing task: both-aspects group (n = 29), positive group (n = 30), and negative group (n = 29).

This study utilized three measurements to evaluate changes in the mood of subjects during the experiment. First, subjects completed the DAMS to deter-

mine baseline (Time 1). Next, after completion of the self-focusing tasks, the DAMS and Private Self-Awareness scale (Sakamoto, 1993) were completed (Time 2). Finally, after a distraction task, the DAMS was completed again (Time 3). The efficacy of the distraction task was confirmed in that each mood had recovered to the same degree as at the baseline. Experiments were conducted individually in university classrooms, and the experiment took approximately 20 minutes to complete. This study was carried out with the approval of the ethics committee of the affiliated university.

3. Results

3.1. Manipulation Check

The mean score of the Private Self-awareness Scale of all subjects was 42.57 (*SD* = 6.02). Those whose score was 2 *SD* or more below the mean score were considered to have not been sufficiently induced to self-focus during the tasks. Thus, four subjects whose score was 30.53 or less were excluded from further analysis. Therefore, the total number of subjects to be analyzed was 84: both-aspects group ($n = 27$), positive group ($n = 28$), and negative group ($n = 29$).

3.2. Condition Effects on Change in Depressed and Positive Mood

Reliability, in terms of internal consistency, was high for each subscale ($\alpha = 0.88$ for depressed mood; $\alpha = 0.85$ for positive mood). The mean scores of depressed mood and positive mood at each period, from Time 1 to Time 3, in each group, are displayed in Table 1. Changes related to self-focus in each mood were analyzed by a 3 (group: both-aspects group, positive group, and negative group) × 2 (time: T1 and T2) mixed-model, two-way ANOVA (Figure 1).

For depressed mood, the interaction between group and time was significant [$F(2, 81) = 5.73$, $p < 0.01$]. As a result of a Bonferroni's main effect test, the main effect of time in the negative group was also shown to be significant [$F(1,81) = 17.47$, $p < 0.001$], with depressed mood increasing at Time 2 compared to Time 1. The main effect of time was not significant in the both-aspects and positive groups [$F(1,81) = 0.22$, *n.s.*; $F(1,81) = 0.48$, *n.s.*]. In addition, the main effect of group at Time 2 was significant [$F(2, 81) = 3.96$, $p < 0.05$], with depressed mood being shown to be significantly higher in the negative group than positive group

Table 1. Means and standard deviations of each mood.

	Both-aspects group ($n = 27$)			Positive group ($n = 28$)			Negative group ($n = 29$)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Depressed mood	9.96	9.67	8.15	8.79	9.21	8.11	9.62	12.17	9.90
	(4.49)	(3.94)	(3.78)	(3.95)	(4.59)	(3.43)	(4.48)	(4.26)	(4.02)
Positive mood	10.70	10.56	11.96	10.54	9.86	11.21	10.41	8.59	10.83
	(3.40)	(2.76)	(2.93)	(2.77)	(3.40)	(2.57)	(3.92)	(3.64)	(3.32)

Note: The upper row shows means, and the lower row shows the standard deviations.

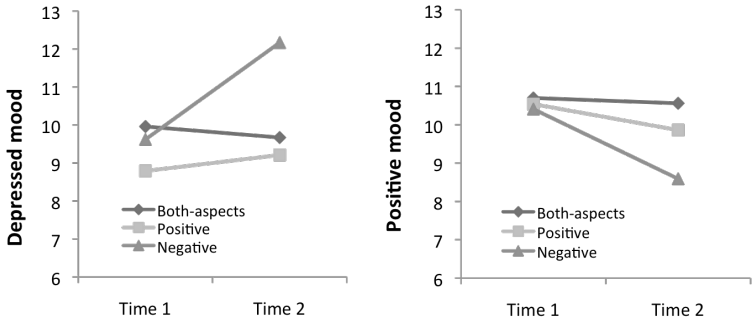

Figure 1. Change in mood after the self-focus task.

($p < 0.05$). Moreover, a marginal difference was observed between the both—aspects group and negative group ($p < 0.10$). However, at Time 1, the main effect of group was not significant [$F(2, 81) = 0.55$, *n.s.*].

For positive mood, the interaction between group and time was significant [$F(2, 81) = 3.31$, $p < 0.05$]. The results of the main effect test showed that the main effect of time in the negative group was significant [$F(1,81) = 15.39$, $p < 0.001$], with positive mood being shown to be significantly decreased at Time 2 compared to Time 1 in the negative group ($p < 0.001$). The main effects of time were not significant for the both-aspects and positive groups [$F(1,81) = 0.09$, *n.s.*; $F(1,81) = 2.05$, *n.s.*]. However, the main effect of group at Time 2 demonstrated a trend towards statistical significance [$F(2, 81) = 2.58$, $p < 0.10$], with a marginal difference observed between both-aspects group and negative group ($p < 0.10$). At Time 1, a main effect of group was not observed [$F(2, 81) = 0.05$, *n.s.*].

3.3. The Recovery of Mood by the Distraction Task

A 3 (group) × 2 (time: T1 and T3) mixed-model, two-way ANOVA was conducted. For depressed mood, the interaction between group and time was significant [$F(2, 81) = 3.30$, $p < 0.05$]. As a result of a Bonferroni's main effect test, the main effect of time in the both-aspects group was shown to be significant [$F(1,81) = 9.60$, $p < 0.01$], with depressed mood being shown to be significantly decreased at Time 3 compared to Time 1 ($p < 0.01$). In the positive and negative groups, a main effect of time was not observed [$F(1,81) = 1.39$, *n.s.*; $F(1,81) = 0.24$, *n.s.*].

For positive mood, the main effect of time was significant [$F(1,81) = 4.62$, $p < 0.05$], with a significant increase observed at Time 3 compared to Time 1. Neither the main effect of group [$F(2, 81) = 0.49$, *n.s.*], nor the interaction of group and time [$F(2, 81) = 0.47$, *n.s.*] was found to be statistically significant.

4. Discussion

The purpose of the current study was to examine the effects of self-focus on mood through manipulation of the attention paid to the valence of self-aspects during a self-focus session. This was done in an effort to obtain suggestions and data for support of an adaptive self-focusing method.

Results showed that individuals who focused upon both positive and negative

aspects of the self (both-aspects group) and only positive aspects (positive group) did not display a significant increase in depressed mood following a self-focus task, and even maintained a positive mood. Conversely, individuals who focused upon negative aspects of the self (negative group) showed a significant increase in depressed mood, and a significant decrease in positive mood. Additionally, depressed mood after performing the task was observed to be lower in the both-aspects and positive groups when compared to the negative group, and positive mood was found to be higher in the both-aspects group when compared to the negative group. These results suggest that focusing on both the positive and negative aspects of the self is more adaptive than focusing only on the negative aspects. In the previous study (Kumada & Oikawa, 2015), a weak negative correlation was shown between the tendency to focus on positive aspects of the self and depressive symptoms, a result that is mostly supported by the information gained from the present study.

From the current results, it was also shown that focusing on both self-aspects is adaptive to the same degree as focusing only on positive aspects, despite the negative focus that is included in this method. However, focusing on both positive and negative aspects of the self was not shown to be more effective in alleviating depressive symptoms when compared to individuals who focused only on positive aspects of the self. It has been suggested that, against emotions related self and self-worth, immediate actions, such as diverting attention from this focus is not effective, and that, conversely, not trying to look directly at the negative aspects of the self induces mental maladjustment and a sense of self-disgust (Satoh & Ochial, 1995; Kosaka, 2009).

In this study, although there were no significant difference in the effects on depressed mood between both-aspects and positive groups, it is possible that differences may have occurred in other negative emotions, such as self-disgust. In addition, it has also been suggested that focusing on both aspects of self is related to the personality traits of displaying curiosity about the self and attempting to analyze oneself (e.g., reflection: Trapnell & Campbell, 1999), which has recently been investigated as an effective form of self-focus for depression prevention (Takano & Tanno, 2010; Kumada & Oikawa, 2015). For example, it has been shown that those who tend to focus on both positive and negative aspects of the self have a higher tendency to reflect than those who focus on only one type of aspect (*i.e.* positive or negative only; Kumada & Oikawa, 2015). Therefore, it may be possible that those with a high tendency to reflect reduce their depression by focusing both aspects of self. Thus, further investigation about the effects of focus on only positive self and both aspects is needed from the viewpoint of the influence on negative emotions other than depressed mood and with relation to reflection.

Results showed that a focus on only negative aspects of the self was the most maladaptive compared to other groups. In a previous study (Kumada & Oikawa, 2015), it has been reported that those with a high tendency to focus on negative aspects of the self demonstrated higher rumination traits and depressive symp-

toms when compared to those with a low tendency towards this behavior. Studies consistently report that negative self-focus leads to depression (e.g., Nolen-Hoeksema & Morrow, 1993; Takano, & Tanno, 2010). In this study, the mood of the negative group seemed to have deteriorated (*i.e.*, increased depressed mood and decreased positive mood) as a result of inducing a ruminating state.

Finally, a distraction task was conducted as part of the ethical considerations of the project. Results showed that negative mood was not sustained in all groups. Therefore, it seems that there was no disadvantage to participants.

Some limitations of the current study should be addressed. First, participants' personality characteristics were not considered. In adolescence, self-focus is likely to be negative (Sakamoto, 1997), and there are many individuals at this stage who exhibit a high rumination trait (Murayama & Okayasu, 2012). Even in this study, it was difficult for those demonstrating high rumination to focus on only positive aspects of the self. Therefore, it may have been possible that the effect was not sufficiently measured. Second, this study examined experimental effects over a short period of time. However, self-focus might occur repeatedly in various situations within everyday life. Due to these limitations, future research should examine the results obtained in this study in more detail. Specifically, analyses should be conducted taking into consideration personality characteristics, and the long-term effects of this positive/both aspect focusing should be explored through use of longitudinal measurements.

5. Conclusion

In conclusion, focusing on both the positive and negative aspects of the self does not amplify depressed mood, and has the same adaptive effects on mood as focusing only on positive aspects of the self. For adolescents, thinking about the self is an indispensable task required for self-formation. Therefore, it seems to be clinically significant to provide a method for adaptive self-focus. In the future, through further development of the current research, and application of these methods in the form of interventions that enhance adaptive self-focus that does not lead to depression, it may be possible to contribute to improving mental health in adolescents.

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Sense of Presence and Anxiety Depending on the Daily Schedules in Junior High Schools

Hiroyuki Yoshida[1], Noriyuki Kida[2]

[1]Faculty of Education, Gunma University, Maebashi, Japan
[2]Graduate School of Science and Technology, Kyoto Institute of Technology, Kyoto, Japan
Email: yoshida-h@gunma-u.ac.jp

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Abstract

In the present study, a questionnaire for easily assessing class adjustment depending on the daily schedule was developed, and characteristics of each setting were examined. Criteria for detecting such students were also developed depending on the daily schedule settings. All the students enrolled in a public junior high school participated in the survey. The number of participants was 331. The sense of presence and anxiety felt in relationships with others were inquired depending on the eight daily schedules below: school arrival/entering classrooms, morning meetings/morning studies, lessons, breaks, lunch, cleaning, end-of-day meetings, and club activities. Aiming to detect students that needed secondary or tertiary support, criteria were examined, with regard to whether a student belonged to the unsatisfied group or not as an objective variable (1: unsatisfied 0: not unsatisfied), with the scores of the sense of presence and anxiety in eight schedules as explanatory variables. Stepwise discriminant analysis was conducted to select the explanatory variable that was the most effective. The results indicated that the sense of presence in the morning meetings and breaks, as well as anxiety in lessons, were selected and significant discriminant function was obtained (Wilks' $\lambda = .723$, $p < .01$). The discriminant function was below $z = -0.18 \times$ presence in morning meetings $- 0.32 \times$ presence in breaks $+ 0.64 \times$ anxiety in lessons $+ 1.10$ and the positive discriminant ratio was 80.4%. Providing student guidance based on daily schedules is considered effective for teachers to understand students and identify students that need secondary support at an early stage.

Keywords

Psycho-Educational Support, Classrooms, School Satisfaction

1. Introduction

Children develop by dealing with various tasks in their school life and teachers

are expected to support children so that they can proactively attend to these tasks. Such support provided by teachers to children is comprehensively known as psycho-educational support services. Ishikuma (1999) classified the services into the following three stages: "Primary services," or the support for dealing with all the needs of children, consisting of preventive support and development promotion support. The former provides services in advance by predicting tasks that many children will face, whereas the latter facilitates the development of adaptability that is required of children during school life. "Secondary services" are the support given to some children needing special consideration, such as those unwilling to go to school, showing a decline in learning motivation, or having difficulties in making friends, among others. "Tertiary support services" are the support for specific children needing individual and special support, such as those absent from school for a long time, getting bullied, or having learning disabilities, among others.

Most of the educational activities conducted in schools are implemented in classrooms. Psycho-educational services are also often provided in classrooms. A classroom is the base unit specified by the educational system. It is a learning group for efficiently achieving educational goals and promoting subject learning. Moreover, it functions as a life group, which facilitates students' sociality. The condition and the environment of a class have a significant effect on students that are enrolled in the class. Psychosocial characteristics of classes are called the classroom climate, which affects various aspects such as children's academic achievement (Anderson et al., 2004; Liu & Wang, 2008; Patrick et al., 2011) and social behaviors (Benard, 2004; Thomas et al., 2011), among others. Findings related to functional aspects of a class in dealing with problem behaviors such as bullying and school refusal as well as school adjustment have been accumulated (Wang et al., 2013; Young et al., 2012).

A questionnaire consisting of multidimensional subscales has often been used as measures for evaluating children's class adjustment and the classroom climate (Chávez, 1984; Ito & Matsui, 2001; Kawamura, 2000; Kurihara & Inoue, 2010; Ito & Matsui, 2001). The Classroom Environment Scale (Trickett & Moos, 1995) and the Learning Environment Scale (Fraser, 1982) are scales for evaluating class adjustment and the classroom climate. Findings related to characteristics of a class and instructional intervention methods have accumulated as a result of using these scales. However, characteristics of classes often differ depending on various environmental factors. For example, the class atmosphere would be different depending on the existence of teachers. Moreover, the content of activities would also affect the class atmosphere; it would be different for example, during lessons from the sports day. The classroom climate is dynamic, and it is important to consider the situation of activities. Therefore, it is difficult to generally quantify a class atmosphere.

Various activities are conducted at schools, such as giving or receiving lessons, taking breaks, and having lunch, among others. Such daily activities are regarded as "daily schedules" in this study, and children and classes were examined de-

pending on the settings of each schedule. Yoshida and Kida (2014) developed a scale for quantitatively evaluating the sense of presence and anxiety in classrooms, by focusing on daily schedules. This scale was designed to detect students that need secondary or tertiary support, and it is highly useful for student guidance. This scale has been standardized depending on daily schedule settings, and comparison between the settings could not be conducted. Furthermore, it was difficult to easily implement the scale, because it consists of 50 or more items.

In the present study, a questionnaire for easily assessing class adjustment depending on the daily schedule was developed, and characteristics of each setting were examined. From the perspective of student guidance, it is especially important to detect students that would require secondary or tertiary support in the early stages. Therefore, criteria for detecting such students were also developed depending on the daily schedule settings.

2. Methods

2.1. Participants

All the students enrolled in a public junior high school participated in the survey. The number of participants was 330 (1st year students; N = 118, boys = 66, girls = 52: 2nd year students; N = 106, boys = 53, girls = 53: 3rd year students; N = 106, boys = 65, girls = 41). The mean age was 13.6 years. The atmosphere of the school was calm, with few students having serious problems related to student guidance.

2.2. Content of the Survey

The sense of presence and anxiety felt in relationships with others were inquired depending on the eight daily schedules below: school arrival/entering classrooms, morning meetings/morning studies, lessons, breaks, lunch, cleaning, end-of-day meetings, and club activities. Regarding the sense of presence, participants were inquired as follows; "Do you feel that your behaviors, ideas, and presence have approved? Do you sometimes have a feeling of satisfaction or fulfillment? Do you sometimes feel happy?" They were also inquired as follows regarding their anxieties; "Do you sometimes feel that you are out of place? Have you ever experienced unpleasant things done by others?" Participants were required to respond using a seven-point scale, ranging from 1 (Not at all) to 7 (Very often).

Furthermore, the school satisfaction scale (Questionnaire-Utilities: Q-U) developed by Kawamura (2000), consisting of 20 items was administered. Participants were required to respond using a five-point scale: often (5 points), sometimes (4 points), occasionally (3 points), rarely (2 points), and never (1 point). This scale consists of two subscales (1) approval score (whether one's presence and behaviors are approved by others) and (2) infringement score (whether one is bullied or teased by others, or has maladaptive feelings). The reliability and the validity have been confirmed. Each subscale consists of 10 items.

2.3. Survey Period and Implementation Methods

The survey was implemented in November 2012 during school hours and class activity time in each class where participants were enrolled. Questionnaires were distributed simultaneously by all the class teachers, responses were made immediately and collected. Class teachers were given instructions on points to note in advance and required to read them aloud before conducting the survey. The questionnaires were filled out anonymously, and participants were clearly informed that their anonymity would be protected. Regarding the consent to the survey, participants were orally informed that they responded by their own free will and need not respond to items that they cannot or do not want to respond. The above procedures were common to all the classes.

2.4. Analysis Procedures

For approval scores and infringement scores, two-way analysis of variance (ANOVA) were conducted with sex (male/female) and school years (1st, 2nd, and 3rd) as between-subject factors. For the scores of sense of presence and anxiety depending on daily schedules, a one-way ANOVA was conducted with the daily schedules as within-subject factors. Cluster analysis (Ward's method, Euclidean distance) was conducted using the mean values of each daily schedule. A two-way ANOVA was conducted with the schedules as within-subject factors and four types of class satisfaction as between-subject factors. IBM SPSS 22 was used for statistical analysis.

3. Results

3.1. Degrees of Class Satisfaction

Fundamental statistics on approval scores and infringement scores of the class satisfaction scale were calculated depending on the school year and sex (Table 1). Two-way analysis of variance (ANOVA) were conducted with sex (male/female) and school years (1st, 2nd, and 3rd) as between-subject factors. The results indicated there were no significant interactions or main effects of approval scores. Nor were significant interactions observed in infringement scores. There were significant main effects of the school year and sex. Males indicated significantly higher scores compared to females. Multiple comparisons were conducted using the Bonferroni method on school years, which indicated that 2nd year students had significantly higher scores compared to 3rd year students.

Next, participants were classified into the following groups based on Kawamura's criteria (2000): the satisfied group (n = 161), infringement recognition group (n = 36), unapproved group (n = 70), and unsatisfied group (n = 64). Table 2 shows cross-tabulation based on the sex and school years. A chi-squared test was conducted and residuals were examined to investigate the effects of sex and school years on the type of class satisfaction. Results indicated that 1st year male students in the unsatisfied group had a significantly higher score compared to female students.

Table 1. Class satisfaction scale.

	School year		
	1st	2nd	3rd
Approval Scores			
Males	33.0 ± 8.3	34.2 ± 5.9	34.6 ± 7.5
Females	35.9 ± 6.1	33.6 ± 5.6	35.3 ± 6.5
Infringement scores			
Males	20.8 ± 7.8	21.0 ± 7.4	18.4 ± 8.1
Females	17.5 ± 7.5	20.0 ± 7.5	17.0 ± 6.3

Table 2. Four types of the class satisfaction.

School years	Sex	4 types								Total
		Satisfied group		Infringement recognition group		Unapproved group		Unsatisfied group		
1st	Males	29	(43.9%)	10	(15.2%)	9	(13.6%)	18	(27.3%)	66
	Females	31	(59.6%)	4	(7.7%)	14	(26.9%)	3	(5.8%)	52
	Total	60	(50.8%)	14	(11.6%)	23	(19.5%)	21	(17.8%)	118
	$\chi^2 = 13.0$**									
2nd	Males	20	(37.7%)	9	(17.0%)	11	(20.8%)	13	(24.5%)	53
	Females	22	(41.5%)	4	(7.5%)	14	(26.4%)	13	(24.5%)	53
	Total	42	(39.6%)	13	(12.3%)	25	(23.6%)	26	(24.5%)	106
	$\chi^2 = 2.4$									
3rd	Males	34	(52.3%)	5	(7.7%)	13	(20.0%)	13	(20.0%)	65
	Females	25	(61.0%)	3	(7.3%)	9	(22.0%)	4	(9.8%)	41
	Total	59	(55.7%)	8	(7.5%)	22	(20.8%)	17	(16.0%)	106
	$\chi^2 = 2.0$									

**, $p < .01$.

3.2. The Sense of Presence and Anxiety Depending on the Daily Schedules

Table 3 shows basic data on the sense of presence and anxiety depending on daily schedules. A one-way ANOVA was conducted with the daily schedules as within-subject factors. The results indicated significant main effects of both the sense of presence and anxiety (presence; $F = 72.6$, $p < .01$; anxiety; $F = 785.4$, $p < .01$). Multiple comparisons were conducted, and schedules were classified into four groups depending on the sense of presence. Morning meetings and morning studies had the lowest score, which was significantly lower than all other schedules. Club activities and breaks had significantly higher scores than all other schedules. Lunch was significantly higher compared to end-of-day meetings, lessons, cleaning, and school arrival and entering classrooms. On the other hand, anxiety was significantly higher in lessons, compared to lunch, end-of-day

Table 3. Evaluation of the sense of presence and anxiety depending on daily schedules.

Daily schedules	Score	
	Presence	Anxiety
Arrival/entering classrooms	4.45 ± 1.39	1.97 ± 1.43
Morning meetings/studies	4.03 ± 1.39	1.93 ± 1.35
Lessons	4.37 ± 1.37	2.08 ± 1.48
Breaks	5.36 ± 1.38	2.01 ± 1.45
Lunch	4.78 ± 1.38	1.91 ± 1.33
Cleaning	4.42 ± 1.45	1.98 ± 1.40
End-of-day meetings	4.29 ± 1.41	1.92 ± 1.35
Club activities	5.22 ± 1.42	2.08 ± 1.38

meetings, as well as morning meetings and morning studies.

Cluster analysis (Ward's method, Euclidean distance) was conducted using the mean values of each daily schedule. Based on the shape of a dendrogram, it was judged that the eight schedules should be classified into four categories (Figure 1). The first category includes morning meetings and morning studies, school arrival and entering classrooms, cleaning, and end-of-day meetings. In this category, both the sense of presence and anxiety indicated low scores. The second category included only lessons, showing low scores for the presence and high anxiety. The third category included only lunch time, indicating high scores for the presence and low anxiety. The fourth category includes breaks and club activities, showing high scores of both presence and anxiety.

3.3. Class Satisfaction and the Sense of Presence and Anxiety

Table 4 shows the mean values of responses for the sense of presence and anxiety in each daily schedule, based on the results of the class satisfaction scale. Figure 2 shows scatter plots indicating the mean values of each schedule. A two-way ANOVA was conducted with the schedules as within-subject factors and four types of class satisfaction as between-subject factors. The results indicated significant interactions in both the sense of presence and anxiety (presence; $F = 2.1$, $p < .01$: anxiety; $F = 2.4$, $p < .01$). Therefore, simple main effects were examined. Regarding the sense of presence, the satisfied group and the infringement recognition groups showed significantly higher scores during lessons, compared to the unapproved group and unsatisfied group. Regarding school arrival, breaks, and lunch time, the satisfied group showed significantly higher scores compared to the unapproved group and unsatisfied group. Moreover, the infringement recognition group showed significantly higher scores compared to the unsatisfied group. In morning meetings, the score of the infringement recognition group was significantly higher compared to the unapproved and the unsatisfied groups. Moreover, at the end-of-day meetings, the scores of the infringement recognition group and the satisfied group were significantly higher

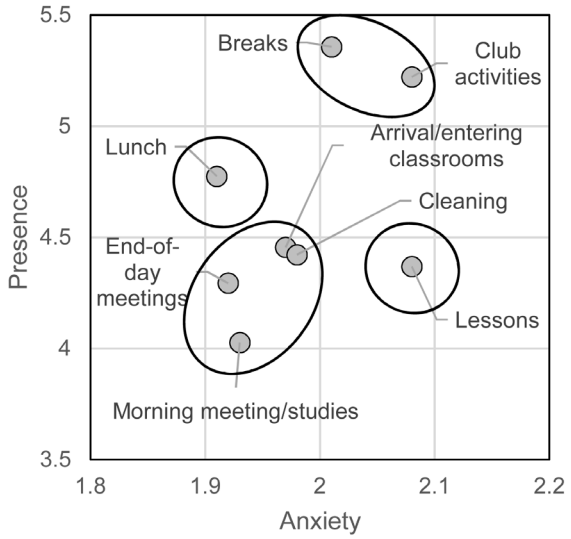

Figure 1. The sense of presence and anxiety depending on daily schedules.

Table 4. Class satisfaction levels and the sense of presence and anxiety depending on daily shedules.

	Class satisfaction levels				
	(A)	(B)	(C)	(D)	
	Satisfied group	Infringement recognition group	Unapproved group	Unsatisfied group	
	$n = 161$	$n = 36$	$n = 70$	$n = 64$	
Presence					
Arrival/entering classrooms	4.77 ± 1.39	4.78 ± 1.22	4.09 ± 1.37	3.87 ± 1.22	D < B; D,C < A
Morning meetings/studies	4.22 ± 1.31	4.67 ± 1.45	3.71 ± 1.43	3.52 ± 1.26	D < A; D,C < B
Lessons	4.64 ± 1.35	5.00 ± 1.31	3.91 ± 1.42	3.84 ± 1.07	D,C < A,B
Breaks	5.75 ± 1.27	5.75 ± 1.08	5.05 ± 1.42	4.48 ± 1.30	D < B; D,C < A
Lunch	5.12 ± 1.32	5.06 ± 1.49	4.54 ± 1.40	4.00 ± 1.10	D < B; D,C < A
Cleaning	4.68 ± 1.40	4.81 ± 1.79	3.99 ± 1.51	4.04 ± 1.10	C < B; C,D < A
End-of-day meetings	4.46 ± 1.40	4.75 ± 1.44	4.06 ± 1.48	3.88 ± 1.22	D < B,A
Club activities	5.51 ± 1.40	5.01 ± 1.58	5.07 ± 1.20	4.79 ± 1.45	D < A
Anxiety					
Arrival/entering classrooms	1.44 ± 0.91	2.78 ± 1.78	1.60 ± 1.16	3.25 ± 1.54	A,C < B,D
Morning meetings/studies	1.43 ± 0.88	2.75 ± 1.66	1.59 ± 1.15	3.08 ± 1.45	A,C < B,D
Lessons	1.47 ± 0.93	3.14 ± 1.84	1.67 ± 1.21	3.47 ± 1.41	A,C < B,D
Breaks	1.43 ± 0.89	3.00 ± 1.96	1.69 ± 1.19	3.28 ± 1.50	A,C < B,D
Lunch	1.39 ± 0.85	2.64 ± 1.61	1.64 ± 1.17	3.09 ± 1.45	A,C < B,D
Cleaning	1.48 ± 1.01	2.64 ± 1.64	1.61 ± 1.18	3.25 ± 1.40	A,C < B,D
End-of-day meetings	1.43 ± 0.88	2.53 ± 1.52	1.59 ± 1.15	3.19 ± 1.50	A,C < B < D
Club activities	1.67 ± 1.06	2.85 ± 1.73	1.70 ± 0.91	3.09 ± 1.62	A,C < B,D

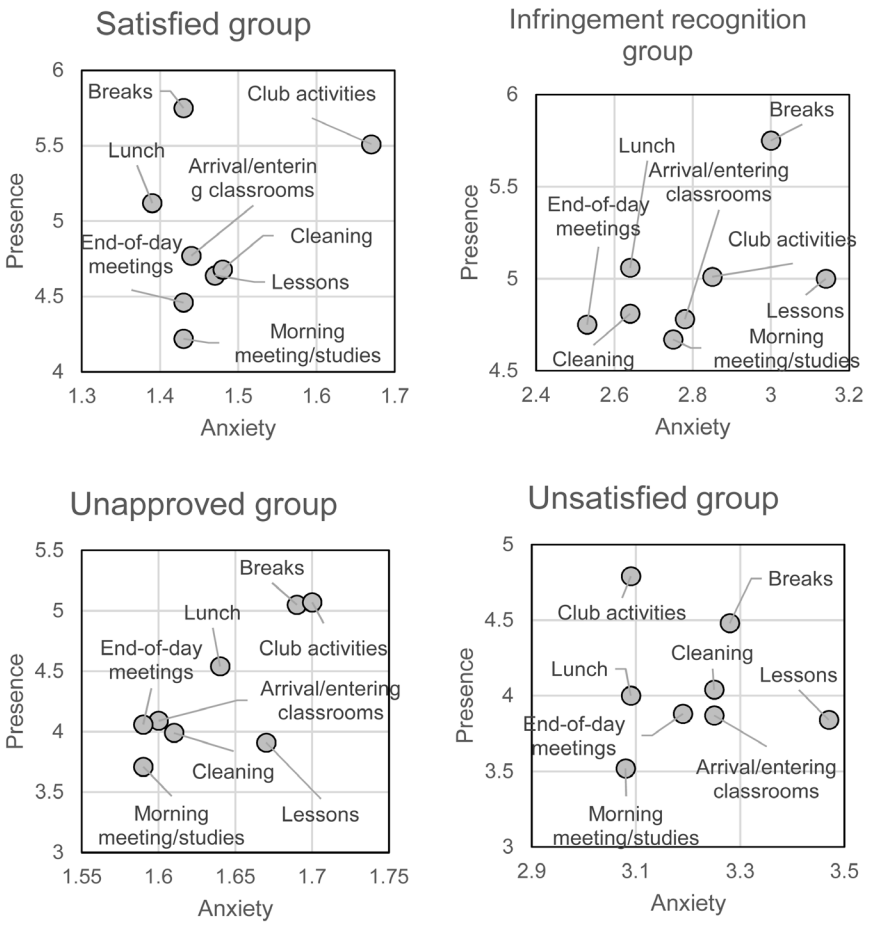

Figure 2. Class satisfaction levels and the sense of presence and anxiety depending on daily schedules.

than the unsatisfied group. Furthermore, regarding club activities, the score of the satisfied group was significantly higher compared to the unsatisfied group. As for anxiety, the scores of the infringement recognition group and unsatisfied group were significantly higher compared to the satisfied group and unapproved group for all the schedules. Regarding end-of-day meetings, the score of the unsatisfied group was significantly higher compared to the infringement recognition group.

Next, scores of the sense of presence were compared among daily schedules. Breaks and club activities showed the highest scores and morning meetings showed the lowest score in all the four groups. In the satisfied group, the scores of lesson hours and school arrival were significantly higher compared to morning meetings. On the other hand, in the infringement recognition group, the score of school arrival was low without significant differences from morning meetings. In the unapproved group, the score of lesson hours was low without significant differences from morning meetings. In the unsatisfied group, scores of both lesson hours and school arrival were low without significant differences from morning meetings. As for anxiety scores, the results of comparison among schedules were as follows: in the satisfied group, the score of club activities was

significantly higher compared to lunch. In the infringement recognition group, scores of breaks and lessons were significantly higher than those of end-of-day meetings, cleaning, and lunch time. There were no significant differences in the unapproved group. In the unsatisfied group, the score of lessons was significantly higher compared to morning meetings, club activities, and lunch.

Aiming to detect students that needed secondary or tertiary support, criteria were examined, with regard to whether a student belonged to the unsatisfied group or not as an objective variable (1: unsatisfied 0: not unsatisfied), with the scores of the sense of presence and anxiety in eight schedules as explanatory variables. Stepwise discriminant analysis (Criteria: Probability-of-F-to-enter < .05; Probability-of-F-to-remove >.10) was conducted to select the explanatory variable that was the most effective, by taking multicollinearity into consideration. The results indicated that the sense of presence in the morning meetings and breaks, as well as anxiety in lessons, were selected and significant discriminant function was obtained (Wilks' $\lambda = .723$, $p < .01$). The discriminant function was below

$z = -0.18 \times$ presence in morning meetings $- 0.32 \times$ presence in breaks $+ 0.64 \times$ anxiety in lessons $+ 1.10$ and the positive discriminant ratio was 80.4%.

4. Discussion

4.1. Class Satisfaction Levels

Infringement scores in females were lower than that in males. Previous studies have indicated that pubescent girls tend to consider interpersonal relationships as more important than boys (Ito, 1993), and women's groups showed behavioral characteristics such as intimacy and exclusivity, which were not observed as often in the men's groups (Mishima, 2003). This suggests that women tend to value interpersonal relationships more than men and feel stronger anxiety. The results of the present study contradicted these findings of previous studies. According to Kawamura's (2000) assessment criteria for class satisfaction, the mean value of approval scores was 32.9, and that of infringement scores was 22.0 in junior high school students. When comparing the results of this study with the national mean values above, approval scores were higher, and infringement scores were lower in both sexes in all the school years. The school environment where this survey was conducted was rather calm, and many students were supposed to be satisfied with class life including relations among classmates. Therefore, stronger anxiety characteristic of pubescent girls might not have been observed in this study. Moreover, although there were significant sex differences in infringement scores, the effect size was small. Therefore, differences depending on the sex and school years were not considered in the following discussion.

4.2. Characteristics of Daily Schedules

The questionnaire conducted in this study adopted identical question items about each daily schedule, which made facilitated comparisons among the eight daily schedules, and they were classified into four groups from the perspective of

the sense of presence and anxiety.

Both the sense of presence and anxiety were low in morning meetings/studies, school arrival/entering classrooms, cleaning, and end-of-day meetings. In these situations, teachers are usually in the classroom and lead these activities in a planned manner. Students play various roles systematically and intentionally while being supported by teachers and they have plenty of opportunities to interact with each other by conducting these activities. Moreover, each student's role is not hard compared to lesson hours. Therefore, students might not feel strong anxiety.

During lesson hours, students indicated a low sense of presence and high anxiety. Lessons are activities that are mainly executed by teachers. Nevertheless, more proactive activities are expected of students during lessons than in morning meetings and end-of-day meetings. Furthermore, students feel anxiety more often than in other situations, such as when giving a speech and interacting with other students in learning. Teachers should give lessons by building a relationship among students, by considering the relationship between teachers and students. At junior high schools, lessons are given using the subject-based teacher system, and teachers other than class teachers tend to have weak relationships with students in their classes. They should try to understand students' subjective adjustment and the class climate in detail.

Students indicated a strong sense of presence and strong anxiety during breaks and club activities. In these situations, teachers usually have fewer opportunities to play a leading role by interacting with students, and students spend the time in a free atmosphere. Direct interactions among students are more freely conducted and students might feel the sense of presence more strongly. On the other hand, students tend to act without considering others because of less intervention by teachers and might have problems in subjective adjustment, which might have increased anxiety. Teachers should note in student guidance that relationships among students have a high degree of influence in these situations.

Students showed a strong sense of presence and little anxiety at lunch time. Activities at lunch time are limited because students mainly eat, and free interactions among students as well as between teachers and students are limited, which might have decreased anxiety.

Based on the above results, it is suggested that in situations with less interactions between teachers and students, such as breaks and club activities, students tend to feel uncomfortable because of others words and activities. Teachers should pay attention to students' anxiety in such situations. On the other hand, in morning meetings, end-of-day meetings, and cleaning, students are protected from anxiety because they are under the teachers' guidance. In these situations, teachers should consider students' sense of presence for increasing their class adjustment and improving the class climate by giving roles to students and providing feedback about their achievements.

4.3. Class Satisfaction Levels and the Sense of Presence and Anxiety Depending on Daily Schedules

The sense of presence and anxiety in each daily schedule were examined depending on the four types of class satisfaction. In the satisfied group, scores during breaks were characteristic. In other three types, both the sense of presence and anxiety were high. On the other hand, in the satisfied group, the sense of presence was high but anxiety was low. It is suggested that teachers' guidance for decreasing anxiety during breaks would be especially important.

In the unsatisfied group, scores during cleaning time, school arrival and entering classrooms, and club activities were characteristic. In other three types, both the sense of presence and anxiety were low during cleaning time and during school arrival and entering classrooms. In the unsatisfied group, in contrast, the sense of presence was low and anxiety was high. Though these settings are under the teachers' guidance, interactions between teachers and students are relatively weak compared to during lessons, and students more often take the initiative in activities. Especially, when arriving in school and entering the classroom, as well as during breaks students spend time in a free atmosphere. From the perspective of guidance, as much consideration as during break times is required in these situations. Regarding club activities, the unsatisfied group showed a low sense of presence and high anxiety, whereas other three types indicated high presence and high anxiety. Activities based on free interactions among students are often observed during club activities. Therefore, sufficient consideration about students' subjective adjustment is required.

Finally, discriminant analysis was conducted with students in the unsatisfied group, because they tend to become the target of bullying and refuse to attend school, which requires secondary or tertiary services. The results indicated that special consideration is necessary for students that have a low sense of presence during a breaks and morning meetings, and feel strong anxiety during lessons. Students that do not have friends and tend to be alone during breaks cannot have a sense of presence because they have few chances to interact with other students. Regarding morning meetings, it is difficult to detect the reasons for the low sense of presence. Students that cannot feel motivated by study or other activities in the morning might have a low sense of presence in the morning meetings. Through giving them a role during morning meetings and during studies, might increase their sense of presence. Teachers should be careful about students' anxiety during lessons. There are various opportunities and situations in which students feel anxiety during lessons. Teachers should recognize these situations and examine when and how they feel anxiety. Students interact with each other when conducting group activities by depending on teaching styles. When they make a speech, they attract other students' attention and might feel anxiety. Lively discussions in class might increase the sense of presence, whereas it might also simultaneously increase anxiety. Infringement might decrease as a result of using the conventional mass teaching style. However, increasing students' sense of presence it also a teaching goal. Therefore, it is suggested that

teachers should keep trying to introduce an interactive teaching style.

As described above, providing student guidance based on daily schedules is considered effective for teachers to understand students and identify students that need secondary support at an early stage. Furthermore, it is a new approach to examine a class climate and students' subjective adjustment from the perspective of daily schedules. It is expected that such studies would increase in the future.

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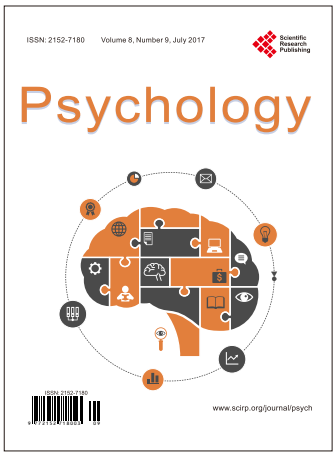

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