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Relationship between working memory and study support of students at higher education institution

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Abstract: At Japanese higher education institutions, there are many difficulties in receiving medical diagnosis, and students offer the support needs by themselves. So how to apply support need for students with developmental disorders is an issue. students with cognitive imbalance do not always have a high level of "Support Need" and often do not lead to utilize study support the purpose of this study is to examine the characteristics of students who need study support in relation to working memory. We divided 71 students into 2 or 3 groups by based on WMI score (High, Middle, Low) or whether they need study support (HNSG) or not (LNSG). For each of them, the results of relations between WMI score and "(a) Support Need Inventory for University Life (Sasaki, Takahashi, & Takeda, 2018)", " (b) AQ Japanese version", " (c) CAARS Japanese version" were described by descriptive statistics respectively. And compared between groups. Result; it was confirmed that the deviations of score related to "Digit Span" is relatively large. It seemed that LSNG might have had "Support Need" and "Autism Spectrum Disorder like characteristics", but their influence on daily life might have been small.

Keywords: working memory; neurodiversity; study support; ;higher education institution; psycho-educational assessment

INTRODUCTION

Although "the Disability Discrimination Law" was enforced in Japan in April 2016, Regarding reasonable accommodation and support for students with developmental disabilities at Japanese higher education institutions, there are many difficulties in receiving medical diagnosis, and students offer the support needs by themselves. So how to apply support need for students with developmental disorders is an issue. Based on the concept of neurodiversity (Austin et al., 2017; ND), "Center for Diversity Accesibility Career Development; DAC Center" at the University of Tsukuba provides multi-layered learning support based on assessments of various developmental characteristics and support need for learning difficulty, and comprehensive and individual assessment of ND students at Japanese higher education institutions. We aim to build a rational consideration and support model based on the above. In addition, it is expected that providing "opportunities" to think about how to compensate for one's weak points based on one's own strengths is not only providing reasonable accommodations at the university, but also providing students with sufficient student life. On the one hand, there are many students who want to take individual psycho-educational assessment to understand themselves, and their needs are very high. On the other hand, there are some students who are unwilling to come to "consultation", or have anxious to be diagnosed.

Kane et al (2007), who performed an N-back task for 132 university students, point out that the task performance is lower than that of the control condition when there are many disturbing stimuli, and point out the relationship between attention control and working memory(WM). Moreover, Okazaki (2017) points out the importance of individual psycho-educational assessment to understand students' cognitive imbalance, and WM is the similar concept with Executive Functions(EF). In University of Tsukuba, students with cognitive

imbalance do not always have a high level of "Support Need" and often do not lead to utilize study support of DAC center. Based on the above, we hypothesized that WM is the key factor of how to plan a prospect of work and perform efficiently, and the purpose of this study is to examine the characteristics of students who need study support in relation to working memory.

METHOD

Subject : 71 students (Male =39, Mean age = 21.0±1.8), who utilize DAC Center's study support and who hope to take individual psycho-educational assessment as a support service of the Center. They are divided into 2 or 3 groups by following procedure.

(1) 3 groups (high WM group, middle WM group, low WM group) by the score of Working Memory Index(WMI), Wechsler Adult Intelligence Scale-fourth edition(WAIS-IV) Japanese version (Ueno et al., 2018), based on ±1 SD or more from the average score of all subjects.
(2) 2 groups, which is whether they need study support (High Support Need Group; HSNG) or not (Low Need Support Group; LNSG).

Procedure : We obtained written and verbal infromed consent for the study subjects. As individual assessments, "The Autism-Spectrum Quotient (AQ) Japanese version (Wakabayashi et al., 2016)", " Conners' Adult ADHD Rating Scales(CAARS; Nakamura et al., 2012) Japanese Version" and "WAIS-Ⅳ Intelligence Test" would be conducted on study subjects. The results of individual assessments will be compiled into a report of about three A4 sheets and the results will be disclosed to the study subjects.

Analysis : For each (1) and (2), the results of relations between WMI score and "(a) Support Need Inventory for University Life (Sasaki, Takahashi, & Takeda, 2018)", " (b) AQ Japanese version", " (c) CAARS Japanese version" were described by descriptive statistics respectively. And compared between groups.

FINDINGS AND DISCUSSION

Finding(s)

It is showed for Table 1 that details of WMI sub-tests for all subjects. It was confirmed that the deviations of score related to "Digit Span" is relatively large. It is showed for Table 2 that details of WMI sub-tests for 3 groups (high WM group, middle WM group, low WM group). It seemed that subjects of high WM group confirmed strategy of "Digit Span" in "Digt Span Forward", and worked on "Digit Span Backward".It is showed for Fig.1 that the results of relations between AQ and Support Need for each group (HNSG, LNSG). Also for Fig.2. For (2), It seemed that LSNG might have had "Support Need" and "Autism Spectrum Disorder like characteristics", but their influence on daily life might have been small.

Table 1 Details of WMI sub-test for all subjects

	DS	AR	DS－AR	DSF	DSB	DSS	DSF－DSB	DSF－DSS	DSB－DSS
Mean	12.54	12.84	-0.30	12.00	12.46	11.36	-0.45	0.63	1.08
SD	3.20	2.04	3.09	3.00	3.41	3.08	3.28	3.07	2.83

SD; Standard Deviation, DS; Digit Span, AR; Arithmetic, DSF; Digit Span Forward, DSB; Digit Span Backward, DSS; Digit Span Sequencing,

Table 2 Details of WMI sub-test for each group

		WMI	DS	AR	DS－AR	DSF	DSB	DSS	DSF－DSB	DSF－DSS	DSB－DSS
Low WMI (N=13)	Mean	95.62	8.00	10.54	-2.54	8.62	8.54	7.54	0.08	1.08	1.00
	SD	6.92	1.66	1.55	2.24	2.13	1.65	1.39	2.27	2.16	1.88
Middle WMI (N=48)	Mean	116.73	12.90	13.08	-0.19	12.42	12.65	11.63	-0.23	0.79	1.02
	SD	5.36	1.90	1.63	2.89	2.38	2.80	2.28	3.47	3.18	3.13
High WMI (N=10)	Mean	134.30	17.22	14.89	2.10	14.67	17.11	15.44	-2.20	-0.70	1.50
	SD	6.12	1.99	1.59	2.95	2.91	0.74	2.31	2.86	3.16	2.25

WMI; Working Memory Index, SD; Standard Deviation, DS; Digit Span, AR; Arithmetic, DSF; Digit Span Forward, DSB; Digit Span Backward, DSS; Digit Span Sequencing,

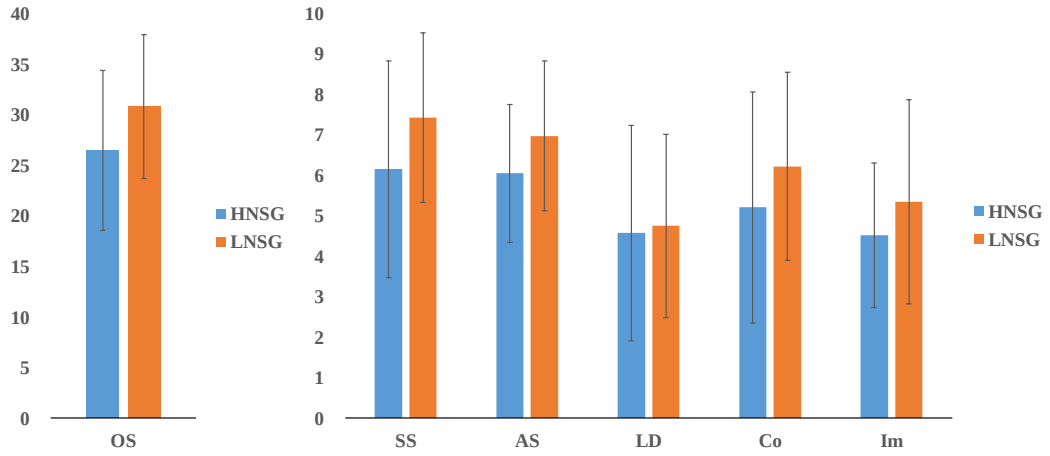

Fig. 1 Results of relations between AQ and Support Need for each group (HNSG, LNSG)

※HNSG; High Need Support Group, LNSG; Low Need Supprot Group, OS; Overall Score, SS; Social Skill, AS; Attention Switching, LD; Local Details, Co; Communication, Im; Imagination

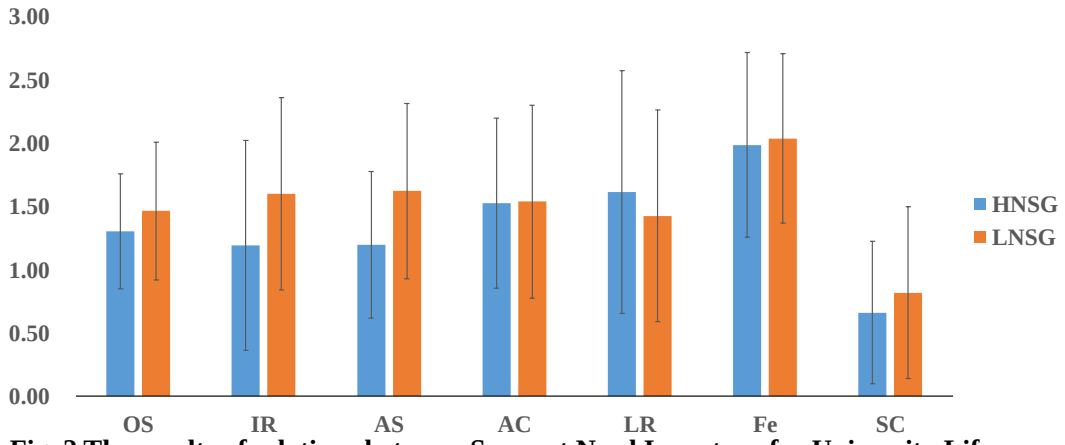

Fig. 2 The results of relations between Support Need Inventory for University Life and Support Need for each group (HNSG, LNSG)

※HNSG; High Need Support Group, LNSG; Low Need Supprot Group, OS; Overall Score, IR; Interpersonal relations, AS; Academic skills, AC; Attention Control, LR; Life Rhythm, Fe; Feelings, SC; Sensory Control

Discussion(s)

For(1), it was suggested that it was necessary to perform the analysis in. Zhang et al. (2018) argued that the poorness of working memory might be involved in difficult to find their own ways voluntarily and to work efficiently with a prospect of work. The results of our study may support such previous studies. However, as a result of the self-written questionnaire that could be compared with their own memories, it was possible that the high WM group had higher AQ and CAARS scores.

For (2), Poposka (2019) points out that applying for reasonable accommodation requires that he/she understand his/her concerns. The results show that the LNSG had high WM score, and that it is possible to voluntarily cope with efficient work with an outlook on work as a whole, so that they did not utilize the study support. In addition, HSNG had a high CAARS score, and ADHD-related symptoms were likely to occur. And it was considered that HSNG was utilizing study support as a coping method. Moreover, HSNG may have chosen to utilize study support as a compensation means or strategy, and it is necessary to provide study support as a “opprtunity” to consider the compensation means and strategies in higher education institutions.

CONCLUSSION

WMI seemed to be the key factor of individual psycho-educational assessment. It was suggested that it was necessary to assess the analysis in, speaking how he/she solve the problem, or worked on. Moreover, it is necessary to provide study support as a "opprtunity" to consider the compensation means and strategies in higher education institutions.

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