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The Role of Personal and Environmental Factors in Autonomous Behavior of People with Intellectual Disability

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ABSTRACT

Studies have indicated that the level of autonomy of people with intellectual disability is influenced by personal and environmental factors. The aims of this cross-sectional and correlational study were: to determine a correlation between the level of autonomy in adults with intellectual disability, on the one hand, and specific personal and environmental factors, on the other hand, and to determine the predictors of the achieved level of autonomy. Adults with mild and moderate intellectual disabilities (N=128) completed self-report Autonomy subscale of The Arc's Self-Determination Scale: Adult Version (Wehmeyer & Kelchner, 1995) and the Choice Questionnaire (Stancliffe & Parmenter, 1999). Their executive functions were assessed individually. Data on participants' social skills were obtained from their caretakers using Vineland Adaptive Behavior Scale – Socialization domain (Sparrow, Cicchetti & Balla, 2006). The results indicated a significant positive correlation between participants' level of autonomous behavior and their age, social skills, availability of choice and executive functions. Significant independent predictors of the autonomy level were: availability of choice, type of housing, gender and age of the participants. It is concluded that it is important to apply the procedures designed to develop the skills of independent decision-making as well as support the encouragement of independent housing.

Keywords: autonomy, availability of choice, intellectual disability, self-determination, supported housing

Introduction

The need for autonomy is one of the most important needs, and the level of its satisfaction lies among the predictors of a person's psychological well-being, regardless of a cultural context (Deci & Ryan, 2008). For the purpose of this paper, autonomy will be interpreted from the perspective of the Causal Agency Theory, which explains how people engage in self-caused action that addresses basic psychological needs (Shogren, Wehmeyer, Palmer, Forber-Pratt, et al., 2015) and how they respond to opportunities or threats to their self-determination by employing volitional and agentic actions, supported and mediated by action-control beliefs (Shogren, Wehmeyer, & Palmer, 2017). When a person acts volitionally, they self-initiate action and autonomously make conscious choices based upon their preferences, interests, and needs (Burke et al., 2020). Autonomy, as a component of volitional action, refers to making an intentional and independent choice based on one's interests without undue external influence (Mumbardó-Adam et al., 2020).

Research studies have shown that people with intellectual disability (ID) have a low level of self-determination (Hagiwara et al., 2020; Mumbardó-Adam et al., 2018, Vega et al., 2018) and that there is a high use of substituted decision making arrangements for adults with ID (Uekert & Van Duizend, 2011). For those people, opportunities to make choices mostly involve deciding to some extent about issues such as daily routines or choosing leisure activities, while in making important life decisions, such as housing, work or selection of support providers, their autonomy is mainly limited or denied (Tichá et al., 2012). These results are especially important given that being self-determined is linked to multiple positive outcomes, including, better employment outcomes, more community access, and enhanced quality of life (Nota et al., 2007; Shogren, Wehmeyer, Palmer, Rifenbark, & Little, 2015).

In addition to determining the level of autonomy of persons with ID, it is important to determine which factors have an influence on the quality of autonomy and voluntary actions in people with ID. Certain authors have pointed out that the literature lacks studies that simultaneously include personal and environmental factors and consider their joint and individual impact on the autonomy of people with ID (Mumbardó-Adam et al., 2017; Shogren et al., 2014). Having that in mind and trying to get a more complete picture of the determinants of autonomy, we chose to explore both groups of factors and opted for a number of personal and social factors, identified in studies in the population of people with mild and moderate ID. During the search, we focused on relevant studies (Arellano & Peralta, 2013; Nota et al., 2007; Stancliffe et al., 2011), some of which are recent (Bigby et al., 2017; Caouette et al., 2018; Mumbardó-Adam et al., 2020), that examined thoroughly the influence of one or more factors and selected those factors whose associations with autonomy and voluntary actions was confirmed in several studies. The factors that were identified by the literature analysis to be related to the level of autonomy of persons with ID or represent predictors of the achieved level of autonomy are: gender, age, level of intellectual functioning, social skills, availability of choices, and type of housing (for example, Arellano & Peralta, 2013; Bigby et al., 2017; Caouette et al., 2018; Mumbardó-Adam et al., 2020; Nota et al., 2007; Stancliffe et al., 2011). These factors of autonomy of people with ID can be classified into a group of personal factors and a group of environmental factors.

With regard to personal factors, women with ID usually have a higher level of autonomy in behavior and in expressing thoughts and ideas, compared to men (Nota et al., 2007), while older people with ID independently make decisions, take responsibility and choose what they want more often than younger ones (Arellano & Peralta, 2013). Nota et al. (2007) determined that higher level of intellectual functioning and better social skills of

people with ID predict higher level of independence in performing daily activities, making choices and expressing wishes and interests.

The literature states type of housing and availability of choice making opportunities as significant environmental factors which influence the level of autonomous behavior in people with ID. Community housing is more convenient for the development and manifestation of autonomous behavior compared to institutional one (Heller et al, 1998). More frequent choice making opportunities have also been determined to be a significant predictor of autonomous behavior – less restrictive types of housing provide more choices for people with ID, while the choice is very limited in more restrictive types of housing, even for the simplest everyday issues (Stancliffe et al., 2011). The importance of providing choices is emphasized by the study results that opportunities to make choices at home affect volitional actions and action-control beliefs of people with ID (Mumbardó-Adam et al., 2020).

All the mentioned factors are included in our study, as potential determinants of the level of autonomy of our participants with ID. Additionally, we hypothesized that certain executive functions may also play a role in the skills of autonomous behavior, based on the assumption that volitional actions involve engaging higher-order abilities (planning, problem solving, mental flexibility, inhibition, initiation, judgment and abstract reasoning), which together form a set of executive functions (Kreutzer et al., 2011). We chose to evaluate three executive functions: inhibitory control, cognitive flexibility and working memory; assuming that autonomous behavior implies consideration of consequences of each option when making a decision (Cavell, 1990), developing, applying, and changing a strategy of action (Smith et al., 2015) and manipulating the information related to the task/problem (Baddeley et al., 2011).

Research on the interaction of multiple factors (personal and social) and their influence on the autonomy of people with ID is scarce in literature, which makes it difficult to draw reliable conclusions about how and to what extent autonomy can be affected in this population. With regard to this, the aims of this research were: to determine a correlation between the level of autonomy in adults with ID, on the one hand, and specific personal (level of ID, gender, age, social skills, executive functions) and environmental factors (availability of choice, type of housing), on the other hand, and to determine the predictors of the achieved level of autonomy.

Materials and Methods

We conducted cross-sectional and correlational study, which analyzed data of variables collected at one given point in time across a study sample and allowed a better understanding of the relationship between autonomy and personal and external factors.

Participants

The research sample included 128 adults with mild intellectual disability (MID) and moderate intellectual disability (MOID), of both genders.

The inclusion criteria were:

- The existence of MID or MOID diagnosis in the participant's records. Data on the participants' level of functioning were taken from psychologists' reports on the assessment of intellectual functioning when making diagnosis, with the majority of participants being diagnosed at school age

- 20-60 years of age

- Living in one of the three types of housing (in a primary family, residential institution, or within a supported housing program)

- Receptive and expressive speech developed sufficiently to understand simple orders, express their own thoughts, wishes and preferences, and take part in conversation about everyday experiences. When selecting participants for the research, we relied on the results of previous assessments of their communication skills by different experts. The results of these assessments were available to us as part of the insight into the participants' personal files.

The exclusion criterion in forming the sample was the presence of autism spectrum disorder symptoms. The reason for this exclusion is that the specifics of communication and socialization of people with autism spectrum disorder would probably have a significant impact on the results obtained, which would lead to difficulties in interpreting the results of the study. In addition, in our conditions, we were not able to collect a critical number of respondents whose communication skills are at the level required for the application of the instruments used in the research.

The age of participants in the final sample ranged from 21 to 58 years of age ($M =$ 33.77; $SD = 9.27$).

Table 1 shows the distribution of the sample with regard to gender, level of ID, and type of housing.

Table 1 here

The subsamples of participants with MID and MOID were uniform with regard to gender ($\chi^2 = 1.551$, $df = 1$, $p = .213$) and age ($t = -1.437$, $df = 126$, $p = .153$). However, they were not uniform with regard to the type of housing ($\chi^2 = 18.190$, $df = 2$, $p < .001$, *Cramer's V* = 0.377). In relation to expected (proportional) frequencies, the participants with MID more frequently lived within families (n=25) and less frequently with support (n=11) or in

institutions (n=5), while the participants with MOID less frequently lived within families (n=21), and more frequently with support (n=31) or in institutions (n=35).

Measures

Autonomy Assessment

The Autonomy subscale of The Arc's Self-Determination Scale: Adult Version (Wehmeyer & Kelchner, 1995) was used to assess autonomy as a component of self-determination. The scale assesses self-determination of adults with ID and was created by adapting the initial version of the scale intended for adolescents. The Autonomy subscale assesses a person's independence and its degree on the basis of personal beliefs, values, interests, and abilities in different areas of life. This subscale consists of two parts: the first refers to autonomous acting, and the second refers to acting with regard to preferences and interests. Autonomous acting is evaluated in two areas: 1) routine personal care and daily household chores (six items), and 2) interaction with the environment (four items). Acting with regard to preferences and interests is evaluated in four areas: 1) recreation and leisure time (six items), 2) community involvement (five items), 3) post-school orientation (six items), and 4) expressing oneself (five items). For each of the 32 mentioned activities, a participant assesses the extent to which he/she engages in the activity when given the opportunity. The answers are presented on a four-point scale: not at all, sometimes, mostly, always, and are scored 0-3, with the higher score reflecting a higher degree of autonomy in the participants' behavior. According to the instructions given by the Scale authors, raw scores are converted to standard scores with values 0-100. Evidence of the concurrent criterion-related validity and construct validity of The Arc's Self-Determination Scale is provided by the Scale authors (Wehmeyer & Kelchner, 1995). In our research, we determined a high internal consistency reliability of the Autonomy subscale ($\alpha = .917$), similar to the value reported by the authors of the Scale (α

= .90 for the Autonomy subscale; Wehmeyer & Kelchner, 1995). For the purpose of determining test-retest reliability, we selected a random sample of 30 participants on whom testing was repeated two weeks after the initial application of the instrument. The subsample included participants of both genders, of different ages and levels of ID, from all three types of housing. A high test-retest reliability of the Autonomy subscale was determined ($r = .844$, $p < .001$).

Social Skills

For the assessment of social skills, we used three subscales of the Vineland Adaptive Behavior Scales – Teacher Form (Sparrow et al., 2006), which together form the Socialization domain. Interpersonal relationships subscale consists of 23 items which comprise different manifestations of behavior when interacting with others. Play and leisure time subscale includes 18 items which describe person's participation in different types of games and leisure activities. Coping skills subscale consists of 19 items which assess participants' self-control and their ability to fit into expected behavioral patterns in different social situations. An informant is expected to determine the frequency of the described behavior in participants for each item, with higher scores indicating better social skills. Behaviors which occur always or often are given grade 2. If a behavior occurs occasionally, the informant will give it grade 1, and if a behavior is manifested very rarely or never, it will be given grade 0. On a sample of 826 participants with ID, De Bildt et al. (2005) concluded that Vineland Adaptive Behavior Scales have high to very high reliability and validity in people with ID of different level of intellectual impairment. High internal consistency reliability for the Socialization domain ($\alpha = .97$), obtained in their study, was also confirmed by the results of our study ($\alpha = .972$).

Working Memory

Verbal working memory was assessed by a version of the Digit Span Backward task, described within the Wechsler Adult Intelligence Scale (Wechsler, 1997). The task implies that the examiner reads sequences of single-digit numbers of increasing length, at a speed of one number per second, and the participant is required to repeat the presented sequence, but in reverse order. For each sequence length (it starts with two numbers, while the longest sequence has eight numbers), there are three tasks which make up one level. Participants' success is measured by the total number of correct answers out of the maximum 21 (one task is given one point).

Non-verbal working memory was assessed by a version of the Corsi Block Test presented by Menghini et al. (2010). The material for this test includes a board with nine equal blocks with 4 cm long edges, in a specific spatial arrangement. The participant and the examiner sit facing each other, with the board on a desk between them. The examiner touches series of blocks in a predefined order, and the participant's task is to touch the same blocks in the same order (in the first part of the test), or to touch the blocks in reverse order (in the second part of the test). For the purpose of this research, we used only the second part of the test, which assesses working memory, while the first part assesses short-term memory. Initially, the examiner touches two blocks, and then the series increase to a maximum of nine. Participants' success is measured by the number of correct answers, with each correct answer carrying one point (maximum number of points is 24).

Inhibitory Control

The Go no Go Task (Spinella & Miley, 2004) was used to assess inhibitory control in the motor domain, and it consists of two parts. In the first part (Conflicting motor response set), the participant is expected to provide an answer opposite to the one presented by the examiner (the examiner knocks once, and the participant twice, and vice versa). The second

part of the task (Delaying motor response) implies that, while imitating the given model, the participant postpones a response at an agreed signal (the participant imitates the examiner when he knocks once, and does nothing when he knocks twice). Each set consists of 30 items, and the participants' success is evaluated on the basis of the number of incorrect items (the number of incorrect answers and latency between the order and performance longer than two seconds).

The Day/Night Stroop Task (Gerstadt et al., 1994) was used to assess the verbal domain of inhibitory control. The test consists of two parts, made up of 50 (2 x 25) cards, arranged on two A4-size papers (5 x 5 layout). In the first part of the test, the participant's task is to name white cards with the drawing of sun on them as "day", and black cards with moon and stars as "night". In the second part of the test, the participant is expected to name the opposite of what he/she sees (to say "night" for the card depicting day, and vice versa). The difference in time needed to complete the first and second part of the task was used to evaluate participants' success.

Cognitive Flexibility

Cognitive flexibility was assessed by the Wisconsin Card Sorting Test, WCST (Heaton et al., 1993). The test is based on the ability to create and modify the principles of categorization, through the task of classifying series of cards according to one out of three classification principles (color, shape and number of elements). The classification principles change successively during the task, what the participant is supposed to conclude on the basis of the examiner's reaction to a previously given answer. Testing material included a deck of cards – 64 cards showing different shapes (a triangle, star, cross or square), colors (red, green, yellow or blue) and number of shapes (one, two, three or four). Participants' achievement was shown through the number of the achieved categories on the test.

Availability of Choice

The Choice Questionnaire (Stancliffe & Parmenter, 1999) consists of 26 items covering different areas of life: household activities, money management, health care, social activities, work and daily responsibilities. For each item, the participant should select one out of three given answers which best describes the extent to which he/she has the opportunity to make choices regarding the activities in the item. The answers are given numerical values on a three-point scale, 3 indicating that participants make choices freely, while 1 indicates that somebody else makes choices for them. Based on data obtained in a study which included adults with mild, moderate and severe ID, Stancliffe and Parmenter (1999) concluded that the Choice Questionnaire had satisfactory concurrent validity, construct validity, content validity, and face validity. High internal consistency reliability for this scale ($\alpha = .81$), determined in the mentioned study, was also confirmed by the results of our study ($\alpha = .896$).

Procedure

The research was conducted in residential institutions, day care centers and associations providing services to people with ID, in seven cities in Serbia. The assessment of autonomy and availability of choice opportunities was carried out through individual interviews with the participants, while the development of executive functions was also evaluated in individual contact situations by using appropriate tasks. Since functional reading skills of most participants were limited, the examiner asked the questions within the Autonomy subscale and the Choice Questionnaire orally, repeating the questions and providing additional explanations (e.g. giving examples of the activities in question, or providing synonyms for unfamiliar words), whenever necessary. Instructions for executive functions tasks were also given to the participants orally, with repeating the instructions and rules for performing the tasks if needed, as well as checking whether the participant understood the rules. Each

participant was tested in two stages in order to prevent fatigue which could affect the quality of responses. Data on participants' social skills were obtained from special educators or occupational instructors who knew the participants well (had been working with them for at least six months), by completing appropriate scales. Data on gender, age and level of intellectual functioning were taken from the documentation of institutions or associations (participants' records). The ethical guidelines of the Special Education and Rehabilitation Code of Ethics in Science and Research – Good Scientific Practice, required for the conduct of this type of researches, were followed during the selection of participants. For taking data from participants' records and conducting the tests for research purposes, we obtained the participant's consent or his/her parents or guardians.

Statistical Analysis

We opted for parametric analysis bearing in mind that the conditions for their application were met. Our sample is not considered small and our dependent variable (level of autonomy) results are normally distributed (result of Kolmogorov-Smirnov test is 0.077; p = .062), which allowed us to select statistically more reliable and powerful analysis (Declare et al., 2009; Fagerland, 2012).

For describing significant parameters we used descriptive statistical measures: mean and standard deviation. Pearson's correlation coefficient was applied to determine the correlation between variables, while T-test and univariate analysis of variance, with Tukey post hoc test, were used to determine the differences between groups. Obtained effect sizes are interpreted in accordance with the criteria given by Cohen (1988). For the purpose of determining predictors of the level of autonomy, we used standard multiple regression and hierarchical multiple regression. IBM SPSS Statistics, version 25.0. was used for data analysis and statistical processing.

For the purposes of multiple regression analysis, qualitative variables (gender, level of ID, and type of housing) were modified into binary (values 0 and 1). For the type of housing, one value included living in the community (with family or in a supported housing program), and the other living in the institution.

Results

The relation between autonomy and selected personal and environmental factors was determined by testing differences between groups (for categorical variables) and testing correlation (for continuous variables).

Taking into account that higher values indicate a higher level of autonomy, Table 2 shows that on average women (compared to men) and persons with MID (compared to persons with MOID) have a higher level of autonomy, and that the level of autonomy is highest in supported living (in comparison with living in the family and in the institution). The results of the T-test (Table 2) confirmed that the level of autonomy was significantly higher in women than in men (small effect size) and in participants with MID compared to the ones with MOID (medium effect size). A statistically significant difference in autonomy in relation to the type of housing was also found and the obtained effect size is considered large (Cohen, 1988). The Post hoc test determined that participants included in supported housing had statistically significantly higher autonomy that the ones living in primary families ($p < .001$) or residential institutions ($p < .001$). No statistically significant difference in autonomy was determined between the participants living in families and those living in institutions ($p = .544$). Obtained effect sizes suggest that type of housing determines level of autonomy of our respondents more than their personal characteristics – gender and level of ID.

Table 2 here

Having in mind the way the scoring of all the variables, it was determined that higher level of autonomy was related to greater availability of choice, older age, higher level of social skills and better developed executive functions (Table 3). Of all the variables included, the level of autonomy was most strongly related to the availability of choice. The association of level of autonomy with the quality of working memory is also considered high (Cohen, 1988), while the association of middle rank was found between level of autonomy and social skills, inhibitory control and cognitive flexibility. Although the association of autonomy with age is statistically significant, it is weak.

Table 3 here

Standard multiple regression was used to determine joint (model influence) and individual influence of all independent and control variables (predictors) used in this research. Ten potential predictors were included in regression analysis. It was determined that the suggested model had a statistically significant predictive value ($F = 31.799$, $p < .001$) for the participants' level of autonomy (Table 4). The coefficient of determination was $R^2 = .731$, so the model made up of independent variables explained 73.1% of variance in the participant's level of autonomy. On the basis of standardized beta coefficient values and the estimation of their statistical significance according to the criterion $p < .05$, gender, age, type of housing and availability of choice made a significant individual contribution to the level of autonomy. According to the values of (squared) partial correlation coefficients, availability of choice had the biggest part in explaining the level of autonomy (29.2%), followed by: type of housing (3.3%), gender (2.2%) and age (1.0%). Taking into account the way in which the variables are coded for the purposes of regression analysis and the values of standardized beta coefficients (Table 4), we conclude that predictors of higher levels of autonomy are more

availability of choice, non-institutional housing (family or supported), female gender and older age.

Table 4 here

Since only four variables made a significant individual contribution to autonomy, hierarchical multiple regression was used to determine the joint influence of these variables on predicting the dependent variable. Regression analysis was applied by putting independent variables in two blocks, with four variables that made significant individual contribution being in the first block, while the second block included six variables for which significant individual contribution was not determined.

According to the coefficient of determination, Model 1 explained 70.8% of the autonomy variance, while after adding the variables from Model 2, together they explained 73.1% of variance (Table 5). The contribution of Model 1 in predicting the level of autonomy was statistically significant, which was not the case with the contribution of Model 2. Thus, the block of four variables: type of housing, availability of choice opportunities, gender and age, explained more than two thirds of the variance in the participants' level of autonomy.

Table 5 here

Discussion

The results of our research showed the existence of a correlation between the level of autonomy of people with ID and certain personal and environmental factors. One of the personal factors was gender, where higher level of autonomy was determined in women than in men. The obtained result is in accordance with literature findings according to which adult women with ID are more successful in making choices, decision making and setting goals than adult men with ID (Hagiwara et al., 2020). It is possible that our results to a certain

extent reflect differently shaped expectations regarding the independence and generally different social roles of men and women. For example, the traditional approach according to which females are more engaged in doing most of the housework is still present today (Cerrato & Cifre, 2018).

With regard to the relation between autonomy and age, research shows that the independence of people with ID in making decisions regarding daily activities and commitments increases from adolescence to adulthood (Nota et al., 2007), and that over time they become more independent in performing practical daily skills (Chadwick et al., 2005). Positive correlation between autonomy and the participants' age, obtained in our sample, cannot be explained by maturation changes, since the sample consisted of adult participants. Thus, we assume that the increase in autonomy with calendar age may be the result of longer practice and application of skills. This assumption is supported by the results of research indicating that self-care and household-care skills and skills of organizing everyday activities (included in the Autonomy subscale in our research) of people with MOID can be improved by practicing (Kaljača & Dapčević, 2011) and that older adults with disabilities have a higher level of self-determination than younger adults, which the authors of the study attribute to individual growth (Hagiwara et al., 2020). Furthermore, it is possible that progress in the acquisition of skills of independent performance of various activities is accompanied by more frequent opportunities for adults with ID, provided by their social environment, to express interests, preferences and goals, and direct their actions. Provided opportunities for self-determination can lead people with ID to perform autonomous actions more often and better and set more complex goals (Di Maggio et al., 2020), which is also confirmed by our results that availability of choice is the most prominent predictor of autonomy of people with MID and MOID.

By examining the relation between autonomy and the level of ID, we determined that the participants with MID were characterized by more independent behavior in accordance with personal preferences, and more independent decision-making in accordance with personal interests, compared to the participants with MOID. Other studies also generally confirm that the level of ID, along with other personal and environmental factors, plays a significant role in determining the level of support needs (Vicente et al., 2019) and level of personal control that these people have (Stancliffe et al., 2000). It is also possible that there is no direct link between the level of ID and independence. Results that indicate that adults with less severe ID experience greater choice and live in smaller settings (Neely-Barnes et al., 2008) suggest that the relation between the level of ID and the level of autonomy should be observed with regard to the social context in which the person lives and availability of opportunities for independent acting.

Similarly to our results that showed that higher autonomy of participants was related to a higher level of social skills acquisition, Nota et al. (2007) found that better social skills of adults with ID were a predictor of more frequent expression of their own wishes, feelings and thoughts, more independent performance of daily activities and more competent choice-making. Shogren et al. (2018) determined that a greater number of social activities in which people with ID participated was a predictor of higher scores when examining their autonomy. They concluded that participation of people with ID in social activities provided opportunities for practicing social skills, which resulted in the improvement in their self-awareness, choice and performance of desired activities, thus encouraging further development of autonomy in behavior. Having in mind that higher levels of independence are related to the achievement of goals related to community living and social participation (Shogren & Shaw, 2017), it is possible that community life enables more intensive practice of social interaction and adjustment skills in people with ID. This assumption is supported by the result that social

skills have not been identified as a significant individual predictor of autonomy levels in our research, so we conclude that their impact is likely to be combined or determined by the type of living environment and opportunity to make choices.

In an effort to interpret the determined correlation between higher autonomy and better developed basic mechanisms of executive functions (working memory, inhibitory control and cognitive flexibility) in our research, we need to consider the role of the mentioned executive functions. In order to practice behavioral autonomy, which involves setting goals, making choices, expressing preferences and making decisions (Shogren, Wehmeyer, & Palmer, 2017), it is necessary for a person to effectively manipulate the information they possess (about their own desires, goals and abilities and environmental conditions), which is enabled by working memory (Baddeley et al., 2011). Research results indicate that individuals with more developed inhibitory control abilities had better conceptual and practical adaptive skills (Gligorović & Buha Đurović, 2014) and it is these adaptive skills that form the basis of independent acting in daily life, included in the Autonomy subscale in our research. The determined relation between cognitive flexibility and success on the Autonomy subscale, can be observed as an argument that flexible approach is the basis of an individual's ability to act independently in daily routines, when it is necessary to replace one strategic pattern of behavior with another, more effective one. This explanation is supported by the results that cognitive flexibility is positively related to the acquisition of practical, conceptual and social skills in children with MID (Gligorović & Buha, 2013). Although an association was found between working memory, inhibitory control, cognitive flexibility and level of autonomy, executive functions did not make a significant independent contribution to the autonomy of our subjects with ID, according to the results of regression analysis. This may lead to the assumption that their connection with the level of autonomy is mediated by the level of intelligence, or vice versa, since research

indicates a certain connection between these two constructs in people with ID (Willner et al., 2010).

The results of our research also indicate the importance of specific environmental factors for the level of autonomy in people with ID. In our sample, supported housing was more suitable for achieving autonomy, compared to institutional housing and living in primary family, between which there was no statistically significant difference. Research confirms the advantages of supported housing, such as greater sense of autonomy, independence and freedom from control (Bigby et al., 2017). The result indicating that the level of autonomy of people with ID living in a family was equal to the one of those living in an institution was somewhat unexpected. This result suggests that primary family and institution support the autonomy of people with ID to a similar extent, and institutional housing is usually recognized as an unsupportive environment for choice making and self-determined behavior (Kozma et al., 2009). A possible explanation for the fact that autonomy of our participants with ID was not sufficiently encouraged by their families might be based on the overprotective attitude of parents toward their (adult) child with ID (Vega et al., 2018). Parents of adults with ID consider it important that decisions regarding their children are in accordance with the family system of values, and point out that the family is responsible for the protection of people with ID and knows best what is good for them (Curryer et al., 2015). It is possible that having insufficient opportunities to take control and direct the course of events in one's life independently, or with necessary support, does not sufficiently contribute to the development of behavioral autonomy of our participants with ID.

Having more choice opportunities predicted greater autonomy of the participants with MID and MOID in our sample, which is in accordance with the allegations that independent choice and decision-making about their own lives is one of the most prominent goals of

people with ID in an effort to meet the need for autonomy (Di Maggio et al., 2020). Furthermore, previous experience at making choices affects the ability of autonomous choice making in adult people with ID (Rawlings et al., 1995). In that regard, creation of autonomy-supportive environments and providing opportunities for choice making are critical for promoting causal agency and autonomous motivation (Shogren, Wehmeyer, & Burke, 2017).

The results of the regression analysis determined that availability of choice is the strongest individual predictor of autonomy, in a way that more choice opportunities predicted greater autonomy of participants with MID and MOID in our sample. A smaller percentage of the variability in the level of autonomy can be predicted with regard to gender (higher in female participants), age (higher in older participants) and type of housing (higher in participants living in family or in supported housing, not in an institution). Level of ID, development of executive functions and the level of social skills acquisition did not prove to be statistically significant independent predictors of the level of autonomy of our participants. A possible explanation for the absence of predictive value of these three variables is that the influence of these factors on autonomy is combined with the influence of some other variables, i.e. there are variables that mediate in the relation between the autonomy level of people with ID and the severity level of ID, executive functions and social skills.

Conclusions

On the basis of the obtained results, we can conclude that autonomy of people with ID, defined from the perspective of the Causal Agency Theory (Shogren, Wehmeyer, Palmer, Forber-Pratt, et al., 2015), is a complex concept which interacts with several personal and environmental factors of people with ID. When it comes to personal factors, the level of autonomy of participants with MID and MOID differs with regard to gender and level of disability and is related to their calendar age, development of executive functions and the

level of social skills acquisition. Considering environmental factors, the level of autonomy of participants with MID and MOID differs with regard to type of housing and is related to availability of choice regarding daily activities. Although it was determined that both personal and environmental factors influenced the participants' ability to act in accordance with their own preferences, interests and abilities, the influence of social circumstances was greater than the influence of personal, basic potentials. These results are encouraging in terms of possibilities for improving the autonomy of people with MID and MOID. Community supported housing and greater availability of choice regarding various life decisions and activities would thus be the optimal environment for improving the autonomy of people with ID within their personal capacities for achieving independence in decision-making and acting.

Reliance on the results of previous assessments of participants' communication skills when selecting participants for inclusion in the sample, could be considered a limitation of our study. More precise and uniform data on communication skills for all respondents would be obtained through our personal application of communication skills assessment tools.

Conflicts of interest

The authors report no conflicts of interest.

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References

Arellano, A., & Peralta, F. (2013). Self-determination of young children with intellectual disability: Understanding parents' perspectives. *British Journal of Special Education, 40*(4), 175–181. https://doi.org/10.1111/1467-8578.12037

Baddeley, A. D., Allen, R. J., & Hitch, G. J. (2011). Binding in visual working memory: The role of the episodic buffer. *Neuropsychologia*, *49*(6), 1393–1400. https://doi.org/10.1016/j.neuropsychologia.2010.12.042

Bigby, C., Bould, E., & Beadle-Brown, J. (2017). Conundrums of supported living: The experiences of people with intellectual disability. *Journal of Intellectual & Developmental Disability*, *42*(4), 309–319. https://doi.org/10.3109/13668250.2016.1253051

Burke, K. M., Shogren, K. A., & Behrens, S. (2020). Mapping the literature on the essential characteristics of self-determination. *Advances in Neurodevelopmental Disorders*, *4*(1), 1–14. https://doi.org/10.1007/s41252-019-00135-9

Caouette, M., Lachapelle, Y., Moreau, J., & Lussier-Desrochers, D. (2018). Descriptive study of caseworkers' practices to support the development of self-determination of adults with intellectual disabilities. *Journal of Policy and Practice in Intellectual Disabilities*, *15*(1), 4–11. https://doi.org/10.1111/jppi.12217

Cavell, T. A. (1990). Social adjustment, social performance, and social skills: A tri-component model of social competence. *Journal of Clinical Child Psychology*, *19*(2), 111-122. https://doi.org/10.1207/s15374424jccp1902_2

Cerrato, J., & Cifre, E. (2018). Gender inequality in household chores and work-family conflict. *Frontiers in Psychology*, *9*, 1330. https://doi.org/10.3389/fpsyg.2018.01330

Chadwick, O., Cuddy, M., Kusel, Y., & Taylor, E. (2005). Handicaps and the development of skills between childhood and early adolescence in young people with severe intellectual

disabilities. *Journal of Intellectual Disability Research*, *49*(12), 877–888. https://doi.org/10.1111/j.1365-2788.2005.00716.x

Cohen, J. (1988) *Statistical power analysis for the behavioral sciences (2nd ed.).* Lawrence Erlbaum Associates.

Curryer, B., Stancliffe, R. J., & Dew, A. (2015). Self-determination: Adults with intellectual disability and their family. *Journal of Intellectual and Developmental Disability*, *40*(4), 394–399. https://doi.org/10.3109/13668250.2015.1029883

De Bildt, A., Serra, M., Luteijn, E., Kraijer, D., Sytema, S., & Minderaa, R. (2005). Social skills in children with intellectual disabilities with and without autism. *Journal of Intellectual Disability Research*, *49*(5), 317–328. https://doi.org/10.1111/j.1365-2788.2005.00655.x

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 182–185. https://doi.org/10.1037/a0012801

Di Maggio, I., Shogren, K. A., Wehmeyer, M. L., & Nota, L. (2020). Self-determination and future goals in a sample of adults with intellectual disability. *Journal of Intellectual Disability Research*, *64*(1), 27-37. https://doi.org/10.1111/jir.12696

Gerstadt, C. L., Hong, Y. J., & Diamond, A. (1994). The relationship between cognition and action: Performance of children $3\frac{1}{2}$-7 years old on a stroop-like day-night test. *Cognition*, *53*(2), 129–153. https://doi.org/10.1016/0010-0277(94)90068-x

Gligorović M., & Buha N. (2013). Kognitivne sposobnosti i adaptivne veštine kod dece sa lakom intelektualnom ometenošću [Cognitive abilities and adaptive skills in children with mild intellectual disability]. In M. Gligorović (Ed.), *Novine u specijalnoj edukaciji i rehabilitaciji* (pp. 99–138). University of Belgrade – Faculty of Special Education and Rehabilitation.

Gligorović, M., & Buha Đurović, N. (2014). Inhibitory control and adaptive behaviour in children with mild intellectual disability. *Journal of Intellectual Disability Research*, *58*(3), 233–242. https://doi.org/10.1111/jir.12000

Hagiwara, M., Shogren, K. A., & Rifenbark, G. G. (2020). Examining the impact of personal factors on scores on the self-determination inventory: Adult report in adults with disabilities. *Journal of Policy and Practice in Intellectual Disabilities*. Advance online publication. https://doi.org/10.1111/jppi.12361

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., Curtiss, G. (1993). *Wisconsin Card Sorting Test manual*. Psychological Assessment Resources, Inc.

Heller, T., Miller, A. B., & Factor, A. (1998). Environmental characteristics of nursing homes and community-based settings, and the well-being of adults with intellectual disability. *Journal of Intellectual Disability Research*, *42*(5), 418–428. https://doi.org/10.1046/j.1365-2788.1998.00155.x

Kaljača, S., & Dapčević, D. (2011). Socijalna kompetencija učenika sa umerenom intelektualnom ometenošću [Social competence of students with moderate intellectual disability]. *Beogradska defektološka škola*, *17*(3), 537-547.

Menghini, D., Addona, F., Costanzo, F., & Vicari, S. (2010). Executive functions in individuals with Williams syndrome. *Journal of Intellectual Disability Research*, *54*(5), 418–432.

Mumbardó-Adam, C., Guàrdia-Olmos, J., & Giné, C. (2018). Assessing self-determination in youth with and without disabilities: The Spanish version of the AIR self-determination scale. *Psicothema, 30*(2), 238–243. doi: 10.7334/psicothema2017.349

Mumbardó-Adam, C., Guàrdia-Olmos, J., & Giné Giné, C. (2020). An integrative model of self-determination and related contextual variables in adolescents with and without

disabilities. *Journal of Applied Research in Intellectual Disabilities*, *33*(1)*,* 856–864. https://doi.org/10.1111/jar.12705

Mumbardó-Adam, C., Shogren, K. A., Guàrdia-olmos, J., & Giné, C. (2017). Contextual predictors of self-determined actions in students with and without intellectual disability. *Psychology in the Schools*, *54*(2), 183-195. https://doi.org/10.1002/pits.21987

Neely-Barnes, S., Marcenko, M., & Weber, L. (2008). Does choice influence quality of life for people with mild intellectual disabilities? *Intellectual and Developmental Disabilities*, *46*(1), 12–26. https://doi.org/10.1352/0047-6765(2008)46[12:DCIQOL]2.0.CO;2

Nota, L., Ferrari, L., Soresi, S., & Wehmeyer, M. (2007). Self-determination, social abilities and the quality of life of people with intellectual disability. *Journal of Intellectual Disability Research*, *51*(11), 850–865. https://doi.org/10.1111/j.1365-2788.2006.00939.x

Rawlings, M., Dowse, L., & Shaddock, A. (1995). Increasing the involvement of people with an intellectual disability in choice making situations: A practical approach. *International Journal of Disability, Development and Education*, *42*(2), 137–153. https://doi.org/10.1080/0156655950420205

Shogren, K. A., Kennedy, W., Dowsett, C., & Little, T. D. (2014). Autonomy, psychological empowerment, and self-realization: Exploring data on self-determination from NLTS2. *Exceptional Children*, *80*(2), 221-235. https://doi.org/10.1177/001440291408000206

Shogren K. A. & Shaw L. A. (2017). The impact of personal factors on self-determination and early adult outcome constructs in youth with disabilities. *Journal of Disability Policy Studies*, *27*(4), 223–233. https://doi.org/10.1177/1044207316667732

Shogren, K. A., Wehmeyer, M. L., & Burke, K. M. (2017). Self-determination. In K. A. Shogren, M. L. Wehmeyer, & N. N. Singh (Eds.), *Handbook of positive psychology in intellectual and developmental disabilities* (pp. 49–64). Springer.

Shogren, K. A., Wehmeyer, M. L., & Palmer, S. B. (2017). Causal Agency Theory. In M. L. Wehmeyer, K. A. Shogren, T. D. Little, & S. J. Lopez (Eds.), *Development of self-determination through the life-course* (pp. 55–67). Springer.

Shogren, K. A., Wehmeyer, M. L., Palmer, S. B., Forber-Pratt, A. J., Little, T. J., & Lopez, S. (2015). Causal Agency Theory: Reconceptualizing a functional model of self-determination. *Education and Training in Autism and Developmental Disabilities*, *50*(3), 251–263.

Shogren, K. A., Wehmeyer, M. L., Palmer, S. B., Rifenbark, G. G., & Little, T. D. (2015). Relationships between self-determination and postschool outcomes for youth with disabilities. *The Journal of Special Education*, *48*(4), 256–267. https://doi.org/10.1177/0022466913489733

Shogren, K. A., Wehmeyer, M. L., Shaw, L. A., Grigal, M., Hart, D., Smith, F. A., & Khamsi, S. (2018). Predictors of self-determination in postsecondary education for students with intellectual and developmental disabilities. *Education and Training in Autism and Developmental Disabilities*, *53*(2), 146–159.

Smith, K. A., Shepley, S. B., Alexander, J. L., & Ayres, K. M. (2015). The independent use of self-instructions for the acquisition of untrained multi-step tasks for individuals with an intellectual disability: A review of the literature. *Research in Developmental Disabilities, 40*(1), 19–30. https://doi.org/10.1016/j.ridd.2015.01.010

Sparrow, S., Cicchetti, D., & Balla, D. (2006). *Vineland Adaptive Behavior Scales – Second Edition.* Pearson Assessments.

Spinella, M., & Miley, W. M. (2004). Orbitofrontal function and educational attainment. *College Student Journal*, *38*(3), 333–339.

Stancliffe, R. J., Abery, B. H., & Smith, J. (2000). Personal control and the ecology of community living settings: Beyond living-unit size and type. *American Journal on Mental Retardation*, *105*(6), 431–454.

Stancliffe, R. J., Lakin, K. C., Larson, S., Engler, J., Taub, S., & Fortune, J. (2011). Choice of living arrangements. *Journal of Intellectual Disability Research*, *55*(8), 746–762.

Stancliffe, R. J., & Parmenter, T. R. (1999). The Choice Questionnaire: A scale to assess choices exercised by adults with intellectual disability. *Journal of Intellectual and Developmental Disability*, *24*(2), 107–132. https://doi.org/10.1080/13668259900033911

Tichá, R., Lakin, K. C., Larson, S. A., Stancliffe, R. J., Taub, S., Engler, J., Bershadsky, J., & Moseley, C. (2012). Correlates of everyday choice and support-related choice for 8,892 randomly sampled adults with intellectual and developmental disabilities in 19 states. *Intellectual and Developmental Disabilities*, *50*(6), 486–504. https://doi.org/10.1352/1934-9556-50.06.486

Uekert, B. K., & Van Duizend, R. (2011). *Adult guardianships: A "best guess" national estimate and the momentum for reform*. National Center for State Courts.

Vega, V., Álvarez, I., & Jenaro, C. (2018). Autodeterminación: Explorando las autopercepciones de adultos con síndrome de Down chilenos [Self-determination: Exploring the auto perceptions of Chilean adults with Down syndrome]. *Siglo Cero, 49*(2), 89–104. http://dx.doi.org/10.14201/ scero 20184 92891 04.

Vicente, E., Verdugo, M. A., Gómez-Vela, M., Fernández-Pulido, R., Wehmeyer, M. L., & Guillén, V. M. (2019). Personal characteristics and school contextual variables associated with student self-determination in Spanish context. *Journal of Intellectual &*

Developmental Disability, *44*(1), 23–34. https://doi.org/10.3109/13668250.2017.1310828

Wechsler, D. (1997). *WAIS-III. Administration and scoring manual*. The Psychological Corporation.

Wehmeyer, M. L., & Kelchner, K. (1995). *The Arc's Self-Determination Scale*. The ARC of the United States.

Willner, P., Bailey, R., Parry, R., & Dymond, S. (2010). Evaluation of executive functioning in people with intellectual disabilities. *Journal of Intellectual Disability Research*, *54*(4), 366-379. https://doi.org/10.1111/j.1365-2788.2010.01249.x

Table 1. Sample distribution with regard to specific socio-demographic variables.

Sample characteristics	*n*	*%*
Gender		
male	68	53.1
female	60	46.9
Level of intellectual disability		
MID	41	32.0
MOID	87	68.0
Type of housing		
Family	46	35.9
Supported housing	42	32.8
Institution	40	31.3

Note. MID: mild intellectual disability, MOID: moderate intellectual disability

Table 2. Differences in autonomy with regard to certain factors.

Variables	n	M	SD	95% CI for Mean Difference	t/F	df	p	d/η^2
Gender								
Male	68	45.01	17.73	[-13.453,	-2.495[a]	126	.014	0.44
Female	60	52.52	16.08	-1.551]				
Level of intellectual disability								
MID	41	55.29	16.51	[3.668,	3.135[b]	126	.002	0.60
MOID	87	45.34	16.86	16.228]				
Type of housing								
Family	46	41.59	18.22					
Supported living	42	59.36	15.09	[45.960, 51.436]	15.426[c]	2	<.001	0.199
Institution	40	45.15	12.65					

Note. MID: mild intellectual disability, MOID: moderate intellectual disability
[a]Levene's test: F = 1.195, p = .276
[b]Levene's test: F = 0.012, p = .912
[c]Result of the Welch test, used after significant Levene's test result (F = 3.863, p = .024), in order to overcome violation of the assumption of homogeneity of variance

Table 3. Correlation between autonomy and different personal and environmental factors.

		Availability of choice	Age	Social skills	Working memory	Inhibitory control (motor)	Inhibitory control (verbal)	Cognitive flexibility
Autonomy	r	.794	.191	.488	.525	-.390	-.450	.338
	p	<.001	.031	<.001	<.001	<.001	<.001	<.001

Table 4. Regression analysis of autonomy with regard to independent variables – standard multiple regression.

Predictor	Beta (stand.)	*t*	*p*	*Part*
Gender	.156	3.110	.002	.149
Level of intellectual disability	-.005	-0.068	.946	-.003
Age	.113	2.053	.042	-.098
Type of housing	.211	3.785	<.001	.181
Availability of choice	.789	11.256	<.001	.540
Social skills	.105	1.686	.094	.081
Working memory	.153	1.719	.088	.082
Inhibitory control (motor)	.047	0.489	.625	.023
Inhibitory control (verbal)	-.048	-0.669	.505	-.032
Cognitive flexibility	-.050	-0.627	.532	-.030

Note. The coding system for statistically significant predictors was: Gender (0 male, 1 female), Type of housing (0 living in institution, 1 living with family or in a supported housing program), Age (in years) and Availability of choice (total scale score).

Table 5. Regression analysis of autonomy with regard to independent variables – hierarchical

multiple regression.

Predictor	R^2	Change R^2	Change F	p
Model 1 (Type of housing, Availability of choice, Gender, Age)	.708	.708	74.688	<.001
Model 2 (Working memory, Level of intellectual disability, Social skills, Inhibitory control (motor), Inhibitory control (verbal), Cognitive flexibility)	.731	.023	1.643	.141