Research in Developmental Disabilities 59 (2016) 80–92

Contents lists available at ScienceDirect

Research in Developmental Disabilities

Cross-syndrome comparison of real-world executive functioning and problem solving using a new problem-solving questionnaire

Joanne S. Camp[a,c,*], Annette Karmiloff-Smith[b], Michael S.C. Thomas[b], Emily K. Farran[a]

[a] Psychology and Human Development, UCL Institute of Education, University College London, 25 Woburn Square, London WC1 H 0AA, UK
[b] Centre for Brain and Cognitive Development, Department of Psychological Sciences, Birkbeck, Malet Street, London WC1E 7HX, UK
[c] Present address: Department of Psychology, School of Psychology and Clinical Language Sciences, University of Reading, RG6 7BE, UK

ARTICLE INFO

Article history:
Received 2 September 2015
Received in revised form 31 May 2016
Accepted 12 July 2016

Keywords:
Problem solving
Executive functioning
Everyday life
Williams syndrome
Down syndrome

ABSTRACT

Background: Individuals with neurodevelopmental disorders like Williams syndrome and Down syndrome exhibit executive function impairments on experimental tasks (Lanfranchi, Jerman, Dal Pont, Alberti, & Vianello, 2010; Menghini, Addona, Costanzo, & Vicari, 2010), but the way that they use executive functioning for problem solving in everyday life has not hitherto been explored. The study aim is to understand cross-syndrome characteristics of everyday executive functioning and problem solving.
Methods: Parents/carers of individuals with Williams syndrome (n = 47) or Down syndrome (n = 31) of a similar chronological age (m = 17 years 4 months and 18 years respectively) as well as those of a group of younger typically developing children (n = 34; m = 8 years 3 months) completed two questionnaires: the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000) and a novel Problem-Solving Questionnaire.
Results: The rated likelihood of reaching a solution in a problem solving situation was lower for both syndromic groups than the typical group, and lower still for the Williams syndrome group than the Down syndrome group. The proportion of group members meeting the criterion for clinical significance on the BRIEF was also highest for the Williams syndrome group. While changing response, avoiding losing focus and maintaining perseverance were important for problem-solving success in all groups, asking for help and avoiding becoming emotional were also important for the Down syndrome and Williams syndrome groups respectively. Keeping possessions in order was a relative strength amongst BRIEF scales for the Down syndrome group.
Conclusion: Results suggest that individuals with Down syndrome tend to use compensatory strategies for problem solving (asking for help and potentially, keeping items well ordered), while for individuals with Williams syndrome, emotional reactions disrupt their problem-solving skills. This paper highlights the importance of identifying syndrome-specific problem-solving strengths and difficulties to improve effective functioning in everyday life.

* Corresponding author.
E-mail address: j.s.camp@reading.ac.uk (J.S. Camp).

http://dx.doi.org/10.1016/j.ridd.2016.07.006
0891-4222/

What this paper adds

This is the first cross-syndrome comparison of everyday executive functioning and problem solving in Williams and Down syndrome. Asking for help was uniquely associated with reaching the solution for the Down syndrome group, pointing to the utility of this strategy for this group when solving problems. Their propensity for keeping possessions in order (measured by the BRIEF) played a large part in differentiating them from the other two groups. For the Williams syndrome group, emotional reactions may disrupt their problem-solving abilities, whilst the large proportion obtaining scores on the BRIEF indicating clinically significant difficulties highlights the everyday struggles with executive functioning that they experience.

1. Introduction

Problem solving is a ubiquitous part of life, whether it involves moving house or choosing lunch: in short, whenever there is a goal to be reached. Goal-directed behaviour relies on executive functioning. Whilst problem solving and executive functioning have been well investigated experimentally, much less is known about them in the context of everyday life.

One of the groups of society perhaps most in need of support with everyday activities are individuals with intellectual disabilities. Williams syndrome (WS) and Down syndrome (DS) are two genetic neurodevelopmental disorders with a similar level of overall cognitive impairment but different cognitive profiles. Both groups struggle with everyday independence. While their executive and adaptive functioning have begun to be investigated (e.g., Carney, Brown, & Henry, 2013; Pennington, Moon, Edgin, Stedron, & Nadel, 2003), little (if anything) is known about their problem-solving skills. In this study we address these gaps in the literature by collecting parent reports of everyday executive functioning and problem solving for groups of adolescents and young adults with WS or DS, and comparing them to parental ratings for typically developing children using a cross-syndrome comparison.

Everyday independence for individuals with WS and DS has been addressed in existing parental reports. In DS, impairments have been noted on the Scales of Independent Behaviour-Revised (SIB-R; Bruininks, Woodcock, Weatherman, & Hill, 1996) for individuals aged between 11 and 19 years (Pennington et al., 2003) as well as in several longitudinal interview studies with parents/carers of individuals with DS, aged between 15 months and 40 years (Carr, 2008). Carr noted that, at age 40, 53% of the group were not allowed outside the garden alone and 69% were not left alone at home for more than an hour. Of 34 participants, 11 had become lost at some point, and on some of these occasions had been escorted home by police after a failed public transport journey. Regarding WS, 92% of a sample of 92 adults aged 19–55 years either lived with their parents/carers or in residential care (Elison, Stinton, & Howlin, 2010). Most could perform self-care tasks with little or no help (77%) but could not carry out household chores (59%). Almost half did not travel independently (49%). In another study. Rhodes, Riby, Park, Fraser, and Campbell (2010) report that their sample of 11 individuals with WS all scored within the abnormal range ($T > 60$) for at least two of the four indexes of the Conners Parent Rating Scale (Conners, 1997). Patterns of responses on the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001) was similar, with ten out of 11 achieving a total difficulty score that was in the abnormal range and the remaining participant achieving a borderline score. To take the failed public transport journeys described by Carr (2008) as a case in point, it is reasonable to attribute this to a failure in the problem-solving process. The everyday difficulties often experienced by both groups clearly warrant further investigation, with respect to problem solving. By conducting a cross-syndrome comparison of real-life problem-solving skills, this study allows conclusions to be drawn about syndrome specificity between WS and DS as well considering abilities in comparison to typically developing individuals.

1.1. Problem solving

Psychological problem-solving research is rooted in cognitive science and neuropsychology. Newell and Simon (1972)'s classic theory describes a problem as consisting of: a start state, a goal state, operators (moves) and constraints. For example, in the Tower of London (TOL) task (Shallice, 1982), three beads are moved between three posts in order to match a goal state, whilst certain rules are followed, including only moving one piece concurrently. Such laboratory tasks are well-controlled and abstract, facilitating examination of each problem-solving step from start to finish.

However, problem characteristics change when we shift focus from a well-controlled testing situation to the less predictable everyday world. A distinction drawn in the literature is between 'well-defined' tasks like the TOL, and 'ill-defined' problems (Reitman, 1965). In an ill-defined problem, the solver may not initially possess all the necessary information: that is, the goal state, operators or constraints might be ambiguous, or there could be more than one correct solution (Kahney, 1986; Pretz, Naples, & Sternberg, 2003). Ill-defined problems are more likely to be encountered in everyday life than in the laboratory (Dunbar, 1998). The public transport journey scenario above (Carr, 2008) is one instance of an ill-defined problem: consider, for example, if the bus were to break down, presumably, one's goal would change from reaching a particular destination to simply getting somewhere safely. This is one example of how everyday problems are more complex and demanding than the types of problems which are generally investigated in experimental settings.

Ill-defined problem solving is less well understood, and has received less attention, than well-defined problem solving (Dunbar, 1998; Reed, 2015). Although some tests exist that measure performance on tasks resembling the real world, such