Untangling the Relationship Between Early Adversity, Placement Breakdowns, and Obesity in a Secure Adolescent Developmental Disorder Service: A Cross-Sectional Study

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Abstract

Background. Obesity is a growing global health concern, and those with a developmental disorder are at particular risk. Elevated levels of childhood trauma, placement breakdowns and obesity have been documented in the developmental disorder population, yet their relative associations remain unclear.

Objective. A previous study (Morris et al., 2020) highlighted a high prevalence of adverse childhood experiences (ACEs) and obesity in adolescents with developmental disorders residing in a secure inpatient setting. The current cross-sectional study sought to further explore the prevalence of placement breakdowns and its relationship with Body Mass Index (BMI) in this sample.

Methods. Secondary analysis was conducted on existing data for 34 adolescents, aged 10-17 years at admission, held in a secure mental health hospital developmental disorder service in the United Kingdom (UK) under the Mental Health Act.

Results. Almost half of participants had experienced a placement breakdown (47.1%), the majority of whom typically experienced multiple breakdowns (M=3.94, *SD=2.14*). Placement breakdowns significantly predicted BMI and had a predictive effect that was independent to and above that of ACEs.

Conclusions. Placement breakdowns significantly contribute to risk for obesity, above that explained by early adversity. Those who have experienced placement breakdowns have a greater risk for obesity, irrespective of their level of exposure to ACEs. A history of previous placement breakdowns may act as a red flag for obesity.

Key words: body mass index, developmental disorder, placement breakdowns, adverse childhood experiences, adolescents

Introduction

Obesity has been deemed one of the most significant global health issues of today, contributing towards the death of nearly five million people globally each year.[1] Within the UK, a third of children are overweight or obese.[2] These figures are set to rise over the next decade, with five million people predicted to be classified as morbidly obese by 2035 in the UK alone.[3] Children and adolescents with a BMI in the obese range are at immediate risk of type II diabetes, hypertension and obstructive respiratory issues.[4] The trajectory of childhood obesity has been found to incline rapidly, with the majority of individuals remaining obese throughout adulthood.[5] Adult obesity brings additional risks of heart disease, cancer, stroke, and premature death.[6]

One population who present with a particular vulnerability to obesity are those with a developmental disorder.[7] Developmental disorders, which include Autism Spectrum Disorder (ASD) and intellectual disabilities, cause impairment across neurodevelopmental, behavioural, emotional and physical domains. Those with a developmental disorder present with an elevated risk for obesity, with almost twice the likelihood for being obese than neurotypical peers.[8,9] Such conspicuous levels of obesity rise across the lifespan[10] and pose a significant health risk, with proliferating impacts on all leading causes of death,[11] contributing towards premature mortality for this group.[12]

Given the significant impacts of obesity, most notably in those with a developmental disorder, there is a need for identification of early determinants. One factor which has been found to hold a strong association with BMI, and is also highly prevalent in the developmental disorder population, is Adverse Childhood Experiences (ACEs).[13,14] ACEs refers to directly experienced maltreatment and witnessed household trauma prior to the age of 18.[15] In relation to obesity, ACEs have been found to positively correlate with incidences

of weight gain in children and adolescents,[16] and contribute to a 46% increase in risk for obesity within adulthood.[17] The effect of ACEs is also dose-responsive, with one ACE increasing the odds of being obese by 1.29,[18] rising consistently to 6.65 when exposed to four or more ACEs.[19]

Early exposure to ACEs is a strong predictor of instability in care,[20] and children exposed to ACEs are more likely to be placed within care services.[21] Upon entering the care system, individuals face further vulnerability for disruption to their environment, and typically face multiple placement breakdowns throughout their time in institutional settings.[22] This vulnerability to placement breakdowns increases with the more types of abuse that are experienced prior to entering the care system.[23]

In recognition of this sequela of early trauma, there has been growing interest in the deleterious impact that placement breakdowns within care can have on outcomes for those exposed to childhood adversity. A placement breakdown can be defined as the early termination of, or unplanned disruption in, care provider, whether initiated by the individual, their parent or carer, or a service, which occurs as a result of a failure to contain or ameliorate risk behaviours. This may include termination of a foster placement, or an unplanned transferral of an individual to another service. Placement breakdowns are considered to fall under the category of 'institutional trauma', which defines the actions, or inactions, by an institution that may either be a direct source of trauma, or may compound the impact of previous adverse experiences.[24] As such, they may represent an additional ACE, separate from the 10 domains included in the widely recognized ACEs framework.[15] Investigation into the impacts of placement breakdowns is particularly necessitated for developmental disorder populations, who are more likely to be placed in the looked after children's system and

inpatient and forensic services,[25] and to experience multiple placement breakdowns within such settings[26,14], than neurotypical peers.

For inpatient developmental disorder populations, institutional factors such as placement breakdowns could in fact be more impactful than ACEs listed within the current framework.[27] As well as increasing emotional distress and engagement in negative behavioural patterns,[28] placement breakdowns may also act as a significant obesogenic risk factor[29] in a population already at-risk for physical health morbidities. Evidence has shown a significantly greater likelihood for obesity in patients residing within specialist developmental disorder settings[29], as well as higher exposure to ACEs than populations not held in mental health hospitals under the Mental Health Act.[25] The pre-existing vulnerability to obesity evident in developmental disorder populations may thus be further inflated in those residing in secure inpatient services, as a result of further placement breakdowns.

In summary, given the interrelated nature of ACEs, placement breakdowns and obesity, disentangling their relative associations is warranted. These relationships are particularly important to explore in people with a developmental disorder residing in inpatient services, due to their pre-existing vulnerabilities. Establishing whether placement breakdowns is an ACE in itself is important to gain a more holistic view of the factors driving risk for obesity and inform both policy developments and treatment approaches.

Aims of the Present Study

The current study sought to establish proof of concept, exploring the placement histories of adolescents held in a secure mental health hospital developmental disorder service, and their relationship to BMI. Specifically, we aimed to (1) quantify the prevalence

of placement breakdowns in this population, and (2) explore the relative associations between ACEs, placement breakdowns and BMI.

Method

Design

Secondary analysis was performed on participant data concerning ACEs, placement breakdowns and BMI obtained in a previous study.[13]

Participants

The sample consisted of 34 adolescent service users admitted to a specialist secure inpatient child and adolescent mental health (CAMHS) developmental disorder service via a national referral pathway. The forty-bed service, comprising of two low and two medium secure wards, provides specialist care for adolescents with developmental disorders and complex mental health needs.

Materials

Data regarding age, ethnicity, gender and number of placement breakdowns were previously extracted from electronic clinical records. The occurrence of a placement breakdown was determined through a file review of existing electronic clinical notes, in accordance with the definition given previously ('the early termination of or unplanned disruption in care which occurs as a result of either a failure to contain or ameliorate risk behaviours'). The most recent height and weight measurements (recorded August 2019) were used to calculate BMI using the metric formula: weight (kg) / height (m^2). Based on standardised BMI categorisations,[30] participants were classified as either 'healthy' (18.5-24.9 kg/m^2), 'overweight' (25-29.9 kg/m^2) or 'obese' (30+ kg/m^2).

Data pertaining to ACE exposure was collected previously for a primary study exploring ACE prevalence.[14] The ACEs questionnaire[15] was completed by an assistant

psychologist for each participant via a retrospective file review of existing clinical records. This measure assesses five 'child maltreatment' ACEs, directly experienced by the individual (physical, sexual and emotional abuse, physical and emotional neglect) and five witnessed 'household' ACEs (parental mental illness, incarceration, substance use, and separation, and domestic violence). A score of one is given to each endorsed ACE, with possible total scores ranging between 0-10. Alternatively, scores can be calculated for 'child maltreatment' ACEs and 'household' ACEs separately[31], with possible scores ranging between 0-5 for each subtype.

Procedure

Data concerning ACEs, number of placement breakdowns and BMI were extracted from participants' electronic clinical records by an assistant psychologist and entered into a database, which was then reviewed by a consultant clinical psychologist from within the service.

Ethical Considerations

The hospitals' research and development team gave research governance approval to use the routinely collected, anonymised data for service evaluation purposes. Participants are informed at admission that routinely collected data may be used for service evaluation purposes, and thus individual consent was not sought.

Data Analysis

Data was analysed using IBM SPSS Statistics v.27. All variables met the assumption of normality, based on the Shapiro-Wilks test values and Z-scores, and thus parametric statistical analyses were utilised.

Frequencies and percentages were calculated to explore the prevalence of a history of placement breakdowns in the sample. To establish an association between placement breakdowns and BMI, a series of Pearson product-moment correlation tests were run. In consideration of the potential confounding effect of length of time spent in services, the association of placement breakdowns and BMI with total length of inpatient admissions and length of current admission was also explored.

To establish the predictive effect of placement breakdowns on BMI, at a category level, an ordinal logistic regression was conducted. To assess the predictive effect of placement breakdowns on BMI, on a continuous level, hierarchical regression analyses were conducted. Given the strong intercorrelation between child maltreatment and household ACEs, two hierarchical regressions were performed, controlling for child maltreatment ACEs and household ACEs, separately. Additionally, considering the correlation between ACEs and placement breakdowns, the interaction effect of these predictor variables on BMI was also explored.

Results

Sample Characteristics

Data was extracted for 41 participants. Seven participants from this sample declined to have their height and/or weight measured, prohibiting the calculation of BMI, and were therefore excluded from the analysis. As a result, 34 participants were included in the final sample. All participants had an ICD-10[32] developmental disorder diagnosis, most commonly mild intellectual disability (55.9%) and 76.5% of the sample also had a comorbid ICD-10 mental health disorder, most commonly Bipolar Disorder (20.6%). As illustrated in Table 1, almost three-quarters of the sample were male (73.5%) and the majority of participants were of Caucasian ethnicity (67.6%). Most participants had a BMI above the healthy range (n=23, 67.6%); of these participants, the majority were obese (n=14, 60.9%).

Table 1

Sample characteristics (n=34)

	n	%	M *(SD)*	Range
Age (years)				
Age at admission			15.06 *(1.32)*	10-17
Age at data collection			17.03 *(1.43)*	13-20
Gender				
Male	25	73.5		
Female	9	26.5		
Ethnicity				
White British	23	67.6		
Bi-racial	5	14.7		
Asian	3	8.8		
Black	2	5.9		
Other	1	2.9		
Body mass index			28.38 *(6.04)*	19-43
Healthy weight	11	32.4		

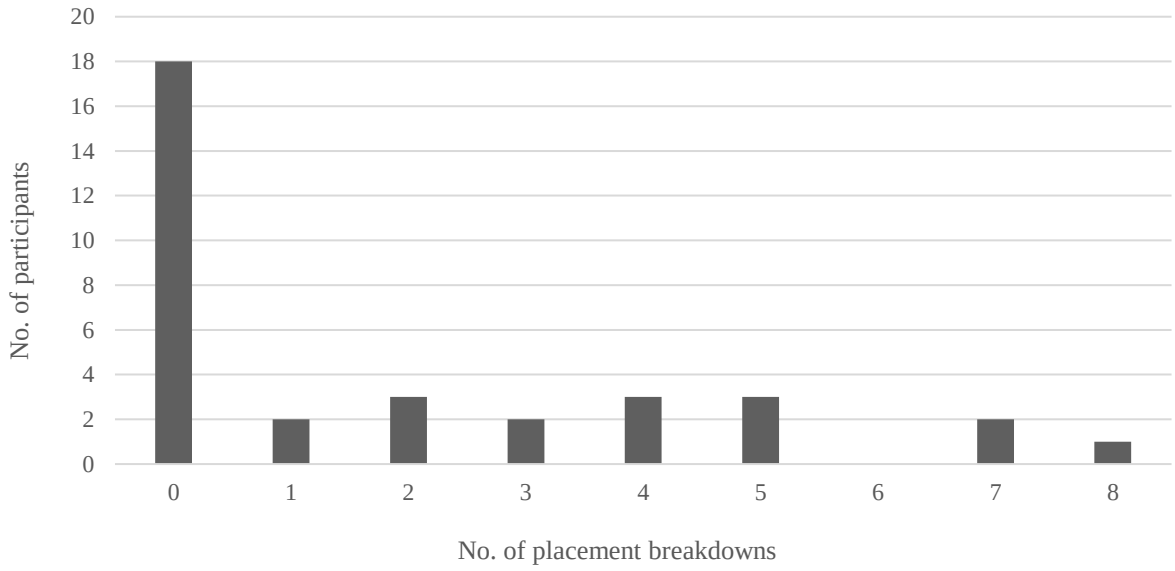
Overweight	9	26.5		
Obese	14	41.2		
Length of admission (months)				
Current inpatient admission			18.18 *(13.18)*	1-65
Total inpatient admissions			20.82 *(15.8)*	1-72

The Prevalence of Placement Breakdowns

Almost half of participants had experienced a placement breakdown (47.1%) prior to their current admission, with an average of 1.85 *(SD=2.46)* placement breakdowns across the sample. When excluding those with no history of placement breakdowns, the average number of placement breakdowns rose to 3.94 *(SD=2.14).* On average, females experienced a greater number of placement breakdowns (M=4.11, *SD=2.98*) than males (M=1.04, *SD=1.67*), and this difference was significant, $t(32) = -3.81$, $p = .001$. The distribution of number of placement breakdowns experienced is illustrated in Figure 1.

Figure 1

Frequency of placement breakdowns experienced across the sample.



The Relationship between Placement Breakdowns and BMI

Correlational Analyses

As illustrated in Table 2, a series of Pearson's correlations analyses showed a statistically significant, moderate positive correlation between placement breakdowns and BMI ($r(32) = .49$, $p = .003$); those who experienced a greater number of placement breakdowns tended to have a higher BMI. A strong positive correlation was also found between ACEs and placement breakdowns ($r(32) = .68$, $p < .001$); those who experienced a greater number of ACEs also tended to experience more placement breakdowns. Length of current admission and total inpatient admissions were not significantly correlated with placement breakdowns nor BMI.

Table 2

Correlations between Body Mass Index [BMI], placement breakdowns, adverse childhood experiences [ACEs], and length of admissions

	BMI	Placement breakdowns	Total ACEs	Child maltreatment ACEs	Household ACEs	Length of current admission	Length of total inpatient admissions
BMI	-						
Placement breakdowns	.487**	-					
Total ACEs	.406*	.679**	-				
Child maltreatment ACEs	.368*	.693**	.910**	-			
Household ACEs	.353*	.498**	.866**	.581**	-		
Length of current admission	.064	.235	.240	.171	.265	-	
Length of total inpatient admissions	.096	.327	.260	.228	.232	.922**	-

Ordinal Logistic Regression

An ordinal logistic regression was conducted to assess the predictive effect of placement breakdowns on BMI category. A significant improvement in model fit was present for the final model over the intercept only model [$\chi^2(1) = 7.77$, p = .005]. A non-significant deviance goodness-of-fit test showed that the model was a good fit to the data, χ^2 (13) = 7.46, p = .88. The Pseudo R^2 values showed that 22-25% of the variance in BMI was explained by the model (Cox and Snell = .217, Nagelkerke = .246). Observation at BMI category level showed that placement breakdowns positively predicted likelihood of obesity. For every unit increase in number of placement breakdowns, this predicted an increase of .41 in the log odds of being obese, Wald $\chi^2(1) = 5.89$, p = .02, 95% CI [.225, 2.11].

Hierarchical Multiple Regression

A two-step hierarchical multiple regression was conducted to explore the predictive effect of placement breakdowns (predictor variable) on BMI (outcome variable), after controlling for child maltreatment ACEs (see Table 3). Child maltreatment ACEs, which were entered at Step 1, contributed significantly to the regression model, F (1,32) = 5.02. p = .03, accounting for 13.6% of the variance in BMI. After entry of placement breakdowns at Step 2, the total variance explained by the whole model was 23.9%, F (2,31) = 4.87, p = .01. The predictor variable explained an additional 10.4% of the variance in BMI, after controlling for child maltreatment ACEs and this change in R^2 was significant, F change (1,31) = 4.22, p = .049. At Step 2, only placement breakdowns was a significant predictor of BMI (p = .049).

There was a high co-occurrence between placement breakdowns and ACEs and the main effect of child maltreatment ACEs on BMI was no longer significant after entry of placement breakdowns; thus, an interaction term between child maltreatment ACEs and

placement breakdowns was entered at Step 3. As child maltreatment ACEs were not a significant predictor at the previous step, this variable was excluded. At Step 3, the interaction term did not significantly contribute to the model and thus only placement breakdowns were included in the final model. The final model was significant, F (1,32) = 9.96, p = .003, with placement breakdowns accounting for 23.7% of the variance in BMI.

A two-step hierarchical multiple regression was also conducted to explore the predictive effect of placement breakdowns (predictor variable) on BMI (outcome variable), after controlling for household ACEs (see Table 4). At Step 1, household ACEs contributed significantly to the regression model, F (1,32) = 4.55. p = .04, accounting for 12.4% of the variance in BMI. After entry of placement breakdowns at Step 2, the total variance explained by the whole model was 25.3%, F (2,31) = 5.26, p = .01. The predictor variable explained an additional 12.9% of the variance in BMI, after controlling for household ACEs and this change in R^2 was significant, F change (1,31) = 5.36, p = .03. In the full model, only placement breakdowns was a significant predictor of BMI (p = .03).

Table 3

Summary of hierarchical regression analysis for child maltreatment adverse childhood experiences [ACEs] and placement breakdowns as predictors of Body Mass Index [BMI]

Variable	ß	*t*	R	R^2	ΔR^2
Step 1			.37	.14	.136
Child Maltreatment ACEs	.37	2.24*			
Step 2			.49	.24	.104
Child Maltreatment ACEs	.06	.27			
Placement Breakdowns	.45	2.05*			
Step 3			.48	.24	-.00
Placement Breakdowns	.49	3.16**`			

Note. ß = standardized coefficients; ΔR^2 = R Square Change; * p < .05, ** p < .01

An interaction term between household ACEs and placement breakdowns was entered at Step 3. As household ACEs were not a significant predictor at the previous step, this variable was excluded. At Step 3, the interaction term did not significantly contribute to the model and was excluded, with only placement breakdowns remaining in the model. As reported previously, the final model was significant, F (1, 32) = 9.96, p = .003, with placement breakdowns accounting for 23.7% of the variance in BMI.

Table 4

Summary of hierarchical regression analysis for household adverse childhood experience [ACEs] and placement breakdowns as predictors of Body Mass Index [BMI]

Variable	ß	*t*	R	R^2	ΔR^2
Step 1			.35	.12	.12
Household ACEs	.35	2.13*			
Step 2			.50	.25	.13
Household ACEs	.15	.82			
Placement Breakdowns	.41	2.31*			
Step 3			.49	.24	-.02
Placement Breakdowns	.49	3.16**			

Note. ß = standardized coefficients; ΔR^2 = R Square Change; * p < .05, **p < .01

Discussion

The current study sought to establish proof of concept and explore the prevalence of placement breakdowns in an adolescent developmental disorder inpatient sample, and untangle its relative associations with ACEs and obesity. Consistent with previous literature, placement breakdowns were frequently experienced in an inpatient developmental disorder population.[26] In parallel to research exploring ACEs listed within the original framework, number of placement breakdowns, as an institutional trauma, positively correlated with BMI and demonstrated a similar dose-response effect. This is a novel finding that tentatively supports the concept that institutional ACEs represent an additional obesogenic risk factor for inpatient developmental disorder populations.[27] Length of stay in services was not associated with BMI, indicating that it is the disruption to placements, rather than time spent within services, that impact obesity risk for this population.

At a category level, number of placement breakdowns was predictive of being obese, but not of being overweight. This suggests the impact of placement breakdowns is strongest at the higher end of the BMI spectrum. Whilst ACEs were a significant predictor of BMI when considered alone, entry of placement breakdowns into the regression model nullified their predictive effect. This finding demonstrates that those with a history of placement breakdowns present with a greater risk for obesity, irrespective of their level of exposure to early adversity. Thus, the findings suggest that placement breakdowns may have a dominant role in driving risk for obesity, which is independent to and above that of ACEs.

Such findings support the expansion of the existing ACEs framework[15] to include institutional ACEs. The impact of leaving one's family home and the enduring negative experiences associated with placement breakdowns, such as the physical and emotional attachment disruption, should be given parity of esteem to existing ACEs when considering the

impact of adverse experiences on obesity risk. This is particularly key for those with a developmental disorder, who have been highlighted as a group at risk for entry into out-of-home care services.[25]

In light of these findings, placement breakdowns may be important red flags for obesity risk. The recognition and evaluation of obesogenic risk factors are essential for early identification, management and prevention of potential health issues. It is important to note that the mechanisms by which ACEs and placement breakdown may lead to obesity are not yet fully understood,[17] and require further exploration to target appropriately within interventions. Nevertheless, the findings from this study suggest that assessing placement history on admission to services could allow for early identification of those most at risk of obesity and present the opportunity to engage in preventative interventions.

A number of other hypotheses may also account for the findings. Firstly, in consideration of the cross-sectional study design, it is possible that the onset of obesity occurred prior to placement breakdowns. As such, the findings may indicate differential treatment and care within services for those who are obese, as a result of weight stigma. The findings may also be accounted for by discrepancies in placement quality. The current study found a positive association between ACEs and placement breakdowns, which may suggest that children with more ACEs are put into placements that are not robust enough to meet their more complex trauma needs, thus lending to a greater risk for breakdowns.

Implications

Although the scope and size of the current study mean that findings are tentative, the findings highlight a number of important implications for both clinical practice and policy. In the first instance, the high exposure to placement breakdowns, particularly in obese

adolescents, is of concern. Within inpatient developmental disorder services, the particular vulnerability of this population for placement instability should be actively considered by clinicians when care planning, putting strategies in place to mitigate this risk. Additionally, moving beyond management methods to preventative strategies, at a macro-level, monitoring of the quality of placements for people with developmental disorders, and particularly those with high exposure to ACEs, is important for ensuring equitable access to appropriate care.

Such findings also highlight the widespread impact of placement breakdowns on service user's health and justifies the integration of this knowledge into the trauma-informed care provided by services. Due to the volatile nature of secure settings, there is often a tendency for psychological factors to take precedence over physical health, resulting in issues such as obesity not being deemed an immediate priority for intervention.[34] However, the findings support the rationale for ensuring routine assessment of obesity risk during admission. Developmental disorder services have an important responsibility for addressing the elevated vulnerability for physical health morbidities in their service user' population, particularly within forensic inpatient settings, where weight gain persists.[29] Through early identification and proactive monitoring of service users' physical health, preventative intervention could be implemented, in turn acting to minimise obesity and the associated adverse health outcomes for a vulnerable population.[8,9]

These findings could also have implications for the current regional and national UK obesity guidance.[34]. Presently, ACEs are listed as a contributor towards obesity, but the additional impact of institutional ACEs for groups most at risk of obesity, such as developmental disorder inpatient populations,[8,9] are yet to be acknowledged. In addition, UK guidance regarding child maltreatment[35] does not recognise obesity as a potential marker of adversity, which could be deemed a considerable oversight in light of the existing literature

regarding this relationship.[16,18,19] Full acknowledgement and incorporation of these relationships within clinical guidance could support the exploration and implementation of preventative strategies to minimise obesity risk for those with a trauma history.

Limitations

The current study offers proof of concept, and has a number of important caveats. The small, specialist sample warrants cautious interpretation of the findings and replication in a large-scale, longitudinal study is necessary. The study may have lacked sufficient power to detect an interaction effect between ACEs and placement breakdowns on BMI. Additionally, it was not possible to control for other factors that may have influenced the findings, such as parental obesity. Furthermore, the study relied on the most recent BMI measurements, taken at a singular timepoint, and data on BMI prior to admission to the service was not available. Whilst it was not within the scope of the study to explore the sequential nature of the relationship between placement breakdowns and BMI, this remains an important question.

The current study is also limited by the gender imbalance existing within the sample. Females have consistently been found to experience a greater number of ACEs than their male counterparts.[36] Therefore, given that participants were predominantly male, the current study could be at risk of underestimating the prevalence and impact of ACEs in developmental disorder inpatient populations.

Furthermore, the current sample were adolescents and thus there is the potential to encounter further ACEs or placement breakdowns prior to reaching adulthood. Exploring these relationships in an adult inpatient developmental disorder population could provide a more comprehensive representation of obesity outcomes and the long-term effects of ACEs and placement breakdowns.

Finally, due to the small sample size, no demographic control variables were included in the regression analyses. Given that exposure to ACEs and placement breakdowns, and levels of obesity are higher in females, as reported in both earlier research[13, 14] and the current study, this reflects a potentially important omission.

Directions for Future Research

Replicating the current study in both a larger adolescent and adult sample is necessary to substantiate the relationship between ACEs, placement breakdowns and BMI. Additionally, in light of gender differences in the prevalence of ACEs and placement breakdowns, as found in both the current study and previous literature,[36] future research should consider this explore findings with regards to the different gender identities existing in the study sample.

Furthermore, whilst the current study evidences proof of concept, demonstrating an independent role for placement breakdowns in driving obesity, exploration of the exact pathways between these factors is warranted. In particular, longitudinal research is necessary to establish the precise order of the relationship between placement breakdowns and BMI. Whether obesity is a consequence of placement breakdowns, or rather those who are obese are more likely to experience placement breakdowns, perhaps by virtue of discrimination, inadequate placements or other secondary factors, can only be answered by a longitudinal design.

Once established, gathering an understanding of the biopsychosocial mechanisms that underpin the relationship between ACEs, placement breakdowns and obesity risk is essential if appropriately targeted preventative intervention is to be delivered. Several potential mechanisms have been proposed, including hypothalamic-pituitary-adrenal [HPA] axis dysfunction.[38] The chronic stress response initiated from these ACEs and placement

breakdowns has been found to impact vital systems involved in metabolic regulation and weight gain.[39] This is of particular relevance to developmental disorder populations who commonly exhibit marked elevation in HPA arousal[40], and highlights a potential avenue for further exploration.

Finally, 'institutional trauma' is an expansive term that encapsulates a range of experiences which may either be a direct source of trauma or may compound the impact of previous adverse experiences, such as being subject to restrictive practices. As such, wider consideration of additional sources of institutional trauma, beyond placement breakdowns, is warranted to further establish its role in driving health outcomes.

Conclusion

Overall, the current study demonstrates a role for placement breakdowns on obesity risk for adolescents with a developmental disorder residing in inpatient care. These findings have valuable clinical significance, highlighting that placement breakdowns could act as a red flag for obesity risk and may aid in the identification, and thus early intervention, of those presenting with such needs; however, further longitudinal research is necessary to confirm this. Beyond this, the current study provides preliminary and tentative support for the notion that institutional ACEs should be given parity of esteem to existing direct and household ACEs when exploring determinants of obesity in vulnerable groups. Going forward, exploration of the mechanisms that underpin the pathways between placement breakdowns and obesity is paramount in informing and implementing successful targeted intervention to reduce obesity risk.

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