

**The Impact of Internalising and Externalising Behaviours on Physical Health in
Australian Boys and Girls 4-7 Years of Age**

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The Impact of Internalising and Externalising Behaviours on Physical Health in Australian Boys and Girls 4-7 Years of Age

Mental illnesses are becoming much more prevalent throughout the population (Jamnik & DiLalla, 2019), with just under half of Australian adults experiencing some form of mental illness in their life (Health Direct, 2020). Moreover, around 1 in 5 Australians face a mental illness each year. The Australian Institute of Health and Welfare (2021) conceptualise mental illness as ‘a clinically diagnosable disorder that significantly interferes with a person’s cognitive, emotional or social abilities.’ Although, it is important to note that an individual may be negatively impacted by their mental health in the absence of a mental illness (Australian Institute of Health and Welfare, 2021). In other words, it is beneficial to consider mental health and mental illness as individual entities working separately (Nib, 2019). Therefore, one can have relatively good mental health while living with a diagnosed mental illness that is being treated effectively, or conversely, one may have poor mental health but not suffer from a mental illness.

Research including that of Edmunds (2018), and Robson and Gray (2007) indicate that Australians experiencing serious mental illnesses are more vulnerable to physical health problems, have higher rates of chronic disease, and have reduced life expectancies compared to the general population (Edmunds, 2018). Therefore, it is unsurprising that mental ill-health is one of the leading causes of death in Australia, with suicide as the primary cause of death among individuals in the 15-24 age bracket (37% of deaths in this age group) (Australian Institute of Health and Welfare, 2021). Additionally, those with mental illness will more often engage in harmful lifestyle choices, including poor nutrition, overeating, smoking, substance abuse, inadequate sleep, and not meet physical activity requirements (Vreeland, 2007). A National Survey of Mental Health and Wellbeing (2020) identified that anxiety

disorders were the most common mental illness (14%), followed by affective disorders, including depression (6.2%).

Emotional and problem behaviours are prevalent mental health difficulties among children and adolescents (Ogundele, 2018). These behaviours can arise in internalised or externalised ways, with some individuals experiencing both. Internalising problems involve directing emotional reactions inward, leading to anxiety, depression, and other psychological issues (Bask, 2014). More specifically, those exhibiting internalising problems may experience fearfulness, somatic troubles, worry, and withdrawal (Monshouwer et al., 2013). In contrast, externalising problems refer to focusing emotional reactions away from oneself, such as exhibiting aggression, rule-breaking, and antisocial behaviour. Moreover, these outward actions may encompass disordered, hyperactive, injurious, and destructive behaviours. Oftentimes, experiencing these externalising conduct problems will result in developing conduct disorder (Liu, 2004). Both internalising and externalising behaviours can elicit high levels of distress. (Monshouwer et al., 2013).

Despite being rarely diagnosed, it is not uncommon for children to suffer from mental ill-health (Silva et al., 2015). While mental health problems in children can result in impaired development, it also increases the risk of mental and psychosocial disorders persisting into adolescence and adulthood (Silva et al., 2015). Childhood is an important time of rapid growth, critical in establishing the foundations essential for healthy development, representative of subsequent health and wellbeing (Australian Institute of Health and Welfare, 2020). In Australia, approximately one in seven children suffer from mental ill-health, with around half of all mental health problems arising before the age of 14 (Beyond Blue, 2021). Mood problems in childhood are particularly worrisome as the health consequences are not completely understood (Jamnik & DiLalla, 2019). While it has been identified that both early internalising and externalising behaviours are predictive of

subsequent problems throughout adulthood, various trajectories have been documented (Narusyte et al., 2017). Therefore, exploring the effect of internalising behaviours and externalising behaviours in Australian children has important public health implications (Jamnik & DiLalla, 2019).

As well as mental illness, physical illness is a major concern for the Australian population. Slightly less than half of Australians (47.3%) suffered from one or more chronic conditions between 2017-2018, increasing by 5.1% from the previous decade (Australian Bureau of Statistics, 2018). In Australia, chronic conditions are the principal cause of physical health problems, with significant consequences for quality of life and wellbeing for not only the individual and their families, but poses major implications for the public health system (Australian Institute of Health and Welfare, 2018). Mental health can be characterised as an individual's psychological and emotional state, while physical health may be depicted as one's biological and somatic state (Jamnik & DiLalla, 2019). The relationship between mental and physical health, or the mind and body, and the influence one has on the other are embedded within the biopsychosocial model. This model recognises that biological, psychological, and social factors are dependent on each other, and that comprehension of the psychological and social factors is necessary for onset, progression, and management of physical illnesses (Jamnik & DiLalla, 2019). This holistic approach therefore supports investigating interrelations between physical health outcomes associated with mental health (Jamnik & DiLalla, 2019). A widespread comorbidity has been established between anxiety and depression, as well as conduct problems, and several physical health problems (Jamnik & DiLalla, 2019). Furthermore, it has been proposed that the relationship between internalising behaviours specifically, and physical health issues may be associated through the autonomic nervous system, impacting immune functioning, which can result in adverse physical health outcomes (Sareen et al., 2006). Moreover, studies such as that of Liu (2017) identify that

children who experience externalising problems will more likely suffer from medical problems, have poorer overall health, develop substance abuse problems, and will have a heightened risk for reproductive ill-health.

Previous research has indicated that boys and girls experience internalising and externalising behaviours in different ways. Vaalamo et al., (2002) uncovered that the association between emotion regulation and physical symptoms is influenced by gender. Moreover, Jamnik & DiLalla (2019), as well as Rosenfield (2002), have proposed that internalising problems are more prevalent among girls, while externalising problems are greater in boys. Further, Mack, Peck and Leiber (2015) have uncovered that the discrepancy in the way males and females experience these behaviours may be due to boys managing adverse events through externalising behaviours such as exhibiting aggression, dishonesty, theft, or violations of rules (Frick & Matlasz, 2018). In contrast, findings suggest that girls may internalise adverse emotions, with consequences of depressive symptoms and lowered self-esteem (Mack, Peck & Leiber, 2015). However, conclusions from this area are not clear, with studies highlighting that the occurrence of childhood emotional problem behaviours are equal throughout boys and girls, and that gender differences in these problem behaviours arise in adolescence (Liu, 2017), while further studies have failed to detect any gender disparities whatsoever (Vaalamo, et al., 2002). As the literature has provided mixed results, it becomes important to explore not only gender differences in internalising and externalising behaviours, but how gender is involved in the relationship between these behaviours and subsequent physical health outcomes.

When assessing this relationship, health inconsistencies related to socioeconomic status (SES) should be examined. These inconsistencies have been extensively documented, with individuals from lower SES groups being at higher risk of infection, disability, disease, and death. Some explanations include the distribution of resources including health care,

nutrition, and hygienic living circumstances (Gallo & Matthews, 2003). The Australian Institute of Health and Welfare (2016) uncovered that death from every cause was 29% higher in the lowest SES group when compared with the highest group. Furthermore, rates of likely preventable deaths due to the absence of timely and efficient health care were 1.8 times higher in the lowest group than the highest group (Australian Institute of Health and Welfare, 2016).

The current study will employ data from Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC) (2018), which is Australia's first nationwide study of its kind (Australian Institute of Family Studies, 2020). The LSAC navigates the growth and development of 10,000 children and their families with a representative sample, employing children from urban and rural parts of all states and territories within Australia. The study investigates an extensive range of research questions regarding child wellbeing, with topics including parenting, family situations, peers, education, child care and a broad range of health matters. As this longitudinal study captures a wide range of variables, it will provide data for the purpose of the current study.

Many studies have used LSAC data to explore risk factors for internalising and externalising behaviours in children and adolescence, however, to the best of my knowledge, there has not yet been a study exploring the effects of internalising and externalising problems on physical health, while also assessing gender and SES within this dataset. For example, Kemmis-Riggs et al. (2020) explored whether parenting style predicts the course of a child's internalising experiences in toddlers. Further, Quach et al. (2018) investigated the bidirectional relationship between sleeping problems and internalising difficulties. Another study conducted by O'Connor et al. (2020) utilised LSAC data to examine whether risk factors for internalising problems in adolescence depend on childhood internalising problems.

Therefore, the current study will explore how internalising and externalising behaviours impact physical health for males and females, while also assessing how SES affects this relationship. The first aim of the study is to examine whether males or females are higher in internalising and externalising behaviours, with the hypothesis that females will have greater rates of internalising behaviours, and males will have increased rates of externalising behaviours. The second aim is to investigate the relationship between internalising behaviours and the physical health outcomes, with the hypothesis that those experiencing greater internalising behaviours will subsequently experience increased physical ill-health. The third aim will explore the relationship between externalising behaviours and the physical health outcomes, hypothesising that increased externalising behaviours will result in greater physical ill-health. The fourth aim will be to identify whether gender moderates the relationship between internalising and externalising behaviours, and physical health outcomes. While the literature comprises mixed results, many studies have uncovered a gender discrepancy, therefore, the hypothesis is that gender will impact this relationship. The fifth aim will investigate whether SES moderates the relationship between internalising and externalising behaviours, and physical health outcomes, with the hypothesis that it will moderate these relationships, due to the status of physical health in low SES groups.

Method

Data Source

The current study employed data from the LSAC (the Longitudinal Study of Australian Children), which is a longitudinal study that collects a wide range of Australian data on various major domains of a child's life (Australian Institute of Family Studies, 2021). The respondents in the study include the Study Child, Parent 1, who is the closest to the child, Parent 2, who is in the home with the child as a parental figure, parents living elsewhere, teachers and child care workers (Growing Up in Australia: The Longitudinal Study of Australian Children, 2018). The study follows the development of two cohorts. Cohort B is the baby cohort, with children 0-1 years of age when the study began. Cohort K refers to the kindergarten cohort, where children were 4-5 years of age when the study commenced (Growing Up in Australia: The Longitudinal Study of Australian Children, 2018). To date, there have been nine waves of data collection (Australian Bureau of Statistics, 2021).

The current study employed Cohort K, and utilised data from Wave's 1 and 2, which were collected in 2004 and 2006, respectively. Children in Wave 1 were 4-5 years of age, and children in Wave 2 were 6-7 years of age. The current study's data set includes 3,447 respondents.

Measures

Internalising Behaviours

Strengths and Difficulties Questionnaire: Emotional Problems Scale. The Strengths and Difficulties Questionnaire (SDQ) Emotional Problems scale is an efficient instrument used to assess emotional problems in children, decreasing the need for additional tools that are complex and require professionals to employ (Silva et al., 2015). This is a 3-point likert scale, where the means of questions are rescaled to represent an integer between 0

and 10. Higher scores indicate higher internalising behaviours. Parent 1 responded to this questionnaire. Questions regard the child's experience over the last six months of areas including complaints of headaches and stomach aches, sickness, and questions concerning worry, fearfulness, and unhappiness. Data from this scale was extracted from the Wave 1 data set.

Externalising Behaviours

Strengths and Difficulties Questionnaire: Conduct Problems Scale. The Conduct Problems scale within the SDQ was used to assess externalising problems. This is another 3-point likert scale, with means of the questions rescaled to represent an integer between 0 and 10. Higher scores indicate higher levels of externalising behaviours. Parent 1 responded to this questionnaire. Corresponding with the internalising scale, these questions are asked concerning past six months. Questions include whether the child often fights with other children or bullies them, and assesses temper tantrums and other similar areas. As a number of children experience both behaviours, it was important for the measures employed to be distinct from one another, measuring the correct behaviour (Liu, 2006). It has been uncovered that the SDQ Emotional Problems Scale and the Conduct Problems Scale are mostly uncontaminated by each other, encouraging use of both measures (Goodman, 2001). Externalising data was extracted from Wave 1.

Physical Health

A combination of three variables assessed physical health outcomes in order to gain a more comprehensive overview. All three measures were extracted from Wave 2.

Pediatric Quality of Life Physical Functioning Scale. The Pediatric Quality of Life Physical Functioning Scale (Peds QL Physical Functioning Scale) was the first measure of physical health. This is a 5-point likert scale, reverse coded so that 1 = 100, meaning that higher scores indicate better physical functioning. Questions involve the past month,

investigating areas including sports and exercise, taking a shower alone, or lifting something heavy (Varni et al., 2001).

Gross Motor Coordination Scale. The Gross Motor Coordination Scale was the second measure to assess physical health. This relates to the coordination of large muscle groups, such as the movement of arms, legs and other large body parts (Queensland Government, 2021). The mean of this 3-point likert scale will be used, with higher scores representing more difficulties. This scale asks questions about the coordination of the study child, in comparison to other children of the same age. Questions include whether the child runs fast, can jump high/far, and can balance well on one leg, compared to other children their age.

Study Child Ongoing Problems. The final measure of physical health assessed the number of ongoing problems the child is experiencing. Questions investigate whether the study child has any ongoing conditions, including frequent headaches, ear infections, and recurrent abdominal pain.

Gender

Gender was assessed as a dichotomous independent variable, extracted from data asking whether the study child is male or female.

Socioeconomic Status

Socioeconomic Indexes for Areas. The Socioeconomic Indexes for Areas (SEIFA) was used to measure SES. SEIFA assesses geographic area by referring to census data, numerically capturing social and economic settings of Australian neighbourhoods. Scores indicate relative socioeconomic advantage and disadvantage, with a national average of 1,000, and a standard deviation of 100 (Australian Bureau of Statistics, 2016), with higher scores specifying greater advantage (Liu, et al., 2017).

Results

Descriptive Statistics

Table 1 illustrates descriptive statistics for each of the nine variables employed in the study, including an overall physical health measure. This physical health measure is a combination of Peds QL Physical Functioning, Gross Motor Coordination, and Ongoing Problems. It was created with a principal components analysis, which is used to systematically decrease several variables into a smaller, more comprehensible variable. It is created on the basis of a linear integration of the original variables (Dunteman, 1989), enhancing interpretability and avoiding data loss (Jolliffe & Cadima, 2016). Refer to table 2 for correlations between these variables and the new measure. There were 3,447 participants in the sample, comprising 1,770 males (51%) and 1,677 females (49%).

Table 1

Descriptive Statistics for Each Variable

	Mean	Median	SD	Min	Max
SES	1009.07	990.00	78.33	840.00	1230.00
Internalising	1.64	1.00	1.60	0.00	9.00
Externalising	2.36	2.00	1.96	0.00	10.00
Gross Motor	1.83	2.00	0.39	1.00	3.00
Peds QL	82.55	85.71	14.69	6.25	100.00
Ongoing Problems	0.34	0.00	0.64	0.00	5.00
PH Problems	0.00	-0.14	1.00	-2.01	6.90

Note. PH Problems = Physical Health Problems.

Table 2

Pearson Correlations Between the Three Physical Health Measures and the New Physical Health Measure Created with Principal Components Analysis

	Peds QL Physical Functioning	Gross Motor Coordination	Study Child Ongoing Problems	New Physical Health Measure
Peds QL Physical Functioning	-			
Gross Motor Coordination	-0.21***	-		
Study Child Ongoing Problems	-0.14***	0.08***	-	
New Physical Health Measure	-0.74***	0.68***	0.53***	-

Note. Peds QL Physical Functioning was scaled with higher scores indicating better functioning, while Gross Motor Coordination and Ongoing Problems were scaled with higher scores indicating poorer functioning. Significance is denoted as: ‘***’ 0.001, ‘**’ 0.01, ‘*’ 0.05.

Relationships Between Internalising Behaviours and Gender, and Externalising Behaviours and Gender

The first hypothesis of the current study predicted that females would have increased levels of internalising behaviours, while males would have greater levels of externalising behaviours. To address this, two Wilcoxon rank sum tests (also known as Mann-Whitney U test) were employed, as a Shapiro Wilk test discovered that the data violated the assumptions

of an independent samples *t*-test. The first test examined internalising behaviours and gender. As can be seen in Table 3, a significant result was found ($p < 0.001$), indicating a significant difference between males and females internalising behaviours. The mean response for male participants was 1.65, while females mean response was 1.63, showing that males had slightly higher internalising behaviours. A Cohen's D effect size was calculated, discovering a very small effect ($d = 0.016$). Therefore, although statistically significant, the effect of the result is minimal. Nevertheless, a significant result revealed a relationship in the opposite direction of the current hypothesis, with males demonstrating higher levels of internalising behaviours than females.

The second Wilcoxon rank sum test assessed externalising behaviours and gender. Another statistically significant result was yielded ($p < 0.001$), indicating that males and females differed significantly in externalising behaviours. The mean externalising score for males was 2.51, while females mean score was 2.20, showing that males scored higher on externalising behaviours than females. A Cohen's D effect size was calculated, yielding another very small effect ($d = 0.16$). Although there was a small effect, the hypothesis of males demonstrating higher externalising behaviours was supported.

Table 3

Wilcoxon Rank Sum Test's Between Internalising Behaviours and Gender, and Externalising Behaviours and Gender

	W	P-value	Cohen's D
Internalising Behaviours	6346179	< 0.001	0.016
Externalising Behaviours	4587501	< 0.001	0.16

Relationship Between Internalising Behaviours and Physical Health Outcomes

The second aim examined the relationship between internalising behaviours and subsequent physical health outcomes, hypothesising that those experiencing greater internalising behaviours would consequently experience higher levels of physical ill-health. A correlation matrix was used to explore this relationship. As can be seen in Table 4, the relationship between internalising behaviours and physical health yielded a weak, positive, significant relationship. This means that internalising behaviours are positively correlated with physical health, supporting the hypothesis.

Relationship Between Externalising Behaviours and Physical Health Outcomes

The third aim explored the relationship between externalising behaviours and physical health outcomes, hypothesising that higher externalising behaviours would result in greater physical health difficulties. Table 4 illustrates the correlation between externalising behaviours and physical health outcomes. A very weak, positive, significant correlation was discovered, supporting the hypothesis that externalising behaviours and physical ill-health would be positively associated.

Table 4

Pearson Correlations Between Gender, Internalising Behaviours, Externalising Behaviours, SES, and Physical Health Problems

	Gender	Internalising	Externalising	SES	PH Problems
Gender	-				
Internalising	-0.01	-			
Externalising	-0.08***	0.27***	-		
SES	0.00	-0.07***	-0.09***	-	
PH Problems	-0.01	0.21***	0.13***	-0.01***	-

Note. Significance is denoted as: ‘***’ 0.001, ‘**’ 0.01, ‘*’ 0.05. PH Problems = Physical Health Problems.

Relationships Between Internalising and Externalising Behaviours, and Physical Health Outcomes

In order to further explore hypotheses 2 and 3, a multiple linear regression was employed, as can be seen in Table 5. The p-value associated with the overall model indicates that the model itself is significant ($p < 0.001$). The R^2 value indicates that 5.1% of variance in physical health outcomes can be explained by the variables in the model. Gender and SES were included in the model in order to gain a more accurate view of the effects of internalising and externalising behaviours, as it is hypothesised that gender and SES could potentially have an effect on physical health outcomes. This means that the model held gender and SES constant when assessing internalising and externalising behaviours on physical health outcomes (the intercept). Both internalising ($p < 0.001$) and externalising ($p < 0.001$) behaviours produced significant results. Therefore, a relative importance regression was conducted to identify the relative contributions to the regression model. Table 5 shows

that internalising behaviours explained 75.6% of the variance explained by model, while externalising behaviours explained the remaining 24.4%.

Table 5

Multiple Regression Exploring Internalising Behaviours, Externalising Behaviours, Gender, and SES on Physical Health Outcomes

Model			
F[4,3442]=45.75, $p < 0.001$			
$R^2 = 0.051$			
	Estimate	P-value	RI
Intercept	-0.472	0.032	
Internalising	0.117	< 0.001	0.754
Externalising	0.044	< 0.001	0.244
Gender	0.003	0.936	0.000
SES	0.000	0.415	0.002

Note. Estimates are unstandardised. RI = proportion of model explained variance attributable to an individual regressor.

Examining Whether Gender Moderates the Relationship Between Internalising and Externalising Behaviours, and Physical Health

The fourth aim examined whether gender moderates the relationship between internalising and externalising behaviours, and subsequent physical health outcomes, with the hypothesis that gender would moderate both relationships. A moderation analysis was conducted with the use of multiple linear regression with interaction. As can be seen in Table 6, the model was significant ($p < 0.001$), and the model accounted for 5.1% of variance in

physical health outcomes. When assessing the p-values for significance, internalising and externalising behaviours were found to be significant, however, gender, the product term of internalising behaviours and gender (Internalising:Gender), and the product term of externalising problems and gender (Externalising:Gender) were all non-significant. This means that gender was not a significant predictor in the model, and additionally, did not moderate the relationship between internalising behaviours or externalising behaviours, and subsequent physical health outcomes, supporting the null hypothesis.

Table 6

Moderation Analysis Exploring Whether Gender Moderates the Relationship Between Internalising and Externalising Behaviours and Physical Health Outcomes

Model		
F[5,3441]=36.65, $p < 2.2e-16$		
R ² = 0.051		
	Estimate	P-value
Intercept	-0.31	< 0.001
Internalising	0.126	< 0.001
Externalising	0.045	0.000
Gender	0.041	0.472
Internalising:Gender	-0.019	0.388
Externalising:Gender	-0.004	0.838

Examining Whether Socioeconomic Status Moderates the Relationships Between Internalising and Externalising Behaviours, and Physical Health

The fifth and final aim of the study explored whether SES moderates the relationship between internalising and externalising behaviours, and consequent physical health outcomes, with the hypothesis that SES would moderate both relationships. As can be seen in Table 7, the model is significant ($p < 0.001$). The R^2 associated with the model suggests that 5.2% of variation in physical health outcomes is explained by the variables in the model. When assessing the p-values, none of the individual variables were significant, including SES, the product term of internalising behaviours and SES (Internalising:SES), and the product term of externalising behaviours and SES (Externalising:SES). Therefore, it was discovered that SES did not moderate the relationship between internalising or externalising behaviours and subsequent physical health outcomes. Again, the null hypothesis was supported, as no significant relationship was found with the product terms.

Table 7

Moderation Analysis Exploring Whether SES Moderates the Relationship Between Internalising and Externalising Behaviours and Physical Health Outcomes

Model		
	$F[5,3441]=37.4, p < 0.001$	
	$R^2 = 0.052$	
	Estimate	P-value
Intercept	-4.602e-03	0.990
Internalising	-1.401e-01	0.316
Externalising	2.008e-02	0.864
SES	-2.895e-04	0.433
Internalising:SES	2.567e-05	0.065
Externalising:SES	2.394e-05	0.837

Discussion

The current study explored how internalising and externalising behaviours impact children's physical health, while also analysing how gender and SES fit into this relationship. Internalising and externalising behaviours both predicted physical ill-health, however, gender and SES did not alter the path of these behaviours and the way they effected physical health outcomes.

Relationships Between Internalising Behaviours and Gender, and Externalising Behaviours and Gender

The first aim of the study examined whether males or females had higher levels of internalising and externalising behaviours. It was hypothesised that females would have greater levels of internalising behaviours. A significant result was found through a Wilcoxon test, indicating that males had higher levels of internalising behaviours than females. This goes against the hypothesis, as it was found that internalising behaviours in the current sample were greater in boys than girls.

There are several interpretations of this finding. Firstly, the large number of participants may be indicative of the significant result, as the means of internalising responses were very close, as well as the revelation of a minimal effect size. Moreover, the hypothesis of girls having higher rates of internalising behaviours than boys was derived from previous literature indicating that females tend to internalise their problems more than males (Jamnik & DiLalla, 2019; Rosenfield, 2002). Although this was hypothesised, mixed results were revealed in the literature, with additional research suggesting that the occurrence of childhood internalising and externalising behaviours may not appear until adolescence (Liu, 2017). Furthermore, additional studies have failed to detect any gender disparities in internalising behaviours (Vaalamo, et al., 2002). Therefore, one interpretation of this finding

may be that these internalising behaviours are not as prevalent in early ages, including the current study with children 4-5 years of age.

It was hypothesised that males would demonstrate greater levels of externalising behaviours than females. The second Wilcoxon test revealed a significant result, indicating that boys had higher levels of externalising behaviours than girls. This suggests that the null hypothesis may be rejected, with support in favour of the alternative hypothesis. Although this was discovered, another very small effect size was found. Nevertheless, this result adds weight to previous research, such as that of Mack, Peck and Leiber (2015), who propose that boys manage negative events through the use of aggression, rule breaking, and other outward behaviours aimed away from oneself.

Relationship Between Internalising Behaviours and Physical Health Outcomes

The second aim of the current study was to explore the relationship between internalising behaviours and physical health outcomes. It was hypothesised that those experiencing higher levels of internalising behaviours would result in greater levels of physical ill-health. The correlation between internalising behaviours and physical health was significant, revealing a weak, positive relationship. This finding supports the hypothesis, in line with previous literature, such as that of Edmunds (2018), and Robson and Gray (2007), who reveal that mental health problems lead to physical health difficulties. Moreover, this finding may add value to previous discoveries that have proposed internalising behaviours and physical health are connected through the autonomic nervous system, in turn impacting physical health (Sareen et al., 2006).

Relationship Between Externalising Behaviours and Physical Health Outcomes

The third aim of the current study explored the relationship between externalising behaviours and the physical health outcomes, with the hypothesis that higher levels of externalising behaviours would result in higher levels of physical ill-health. A significant

very weak, positive correlation was discovered, suggesting that the null hypothesis may be rejected. This adds weight to the findings of Jamnik & DiLalla (2019), proposing a comorbidity between externalising behaviours and physical health problems. This additionally supports Liu's (2017) findings, suggesting that children experiencing externalising behaviours including conduct problems, have higher rates of medical problems and poorer overall physical health.

Does Gender Moderate the Relationship Between Internalising and Externalising Behaviours, and Physical Ill-Health?

The fourth aim of the current study was to identify whether gender moderated the relationship between internalising and externalising behaviours individually, and physical health difficulties. It was hypothesised that gender would moderate both of these relationships. A multiple linear regression with interaction revealed that gender was not a significant predictor of physical health in the model, meaning that gender alone did not impact physical health. Furthermore, the product term of internalising behaviours and gender, as well as the product term of externalising behaviours and gender, were both nonsignificant. Consequently, the null hypothesis is supported, as gender was not a significant moderator in this relationship. As previous research has discovered that both internalising and externalising behaviours result in vulnerability to physical ill-health (Edmunds, 2018), and that boys and girls experience internalising and externalising behaviours differently (Mack, Peck & Leiber, 2015), this was determined to be an interesting area to investigate in the current study. Furthermore, limited studies have investigated how gender would moderate these relationships in children as young as 4-7. Although it was uncovered that gender did not moderate the relationship, this is still an interesting piece of evidence to add to current literature. This infers that here, gender did not determine physical health outcomes based on the way young boys and girls experience internalising and externalising behaviours.

A possible explanation for this may be that children in this age bracket are still developing internalising and externalising problems, and may not experience them at the rates that adolescents or adults may be experiencing them. Therefore, examining such a specific path to physical health difficulties may not be as straightforward or as strong as that of individual's with more defined internalising and externalising behaviours.

Does Socioeconomic Status Moderate the Relationships Between Internalising and Externalising Behaviours, and Physical Health?

The fifth aim of the current study explored whether SES moderated the relationship between internalising and externalising behaviours individually, and physical ill-health. It was hypothesised that SES would moderate both of these relationships. SES was not a significant predictor in the model, meaning that SES did not explain any variance in physical health outcomes. Moreover, the product terms for both internalising behaviours and SES, and externalising behaviours and SES were non-significant. As SES did not moderate either of these relationships, the null hypothesis was supported. This was another intriguing area to investigate as much research has explored the relationships between internalising and externalising behaviours, and SES (Korous et al., 2018; Lansford et al., 2018), as well as SES and physical health outcomes (House et al., 1990), however, limited research has examined the way SES specifically impacts the relationships between internalising and externalising behaviours, and subsequent physical health outcomes.

It is interesting to discover that SES did not moderate the relationship in this case, as statistics derived from The Australian Institute of Health and Welfare (2016) report high levels of inconsistencies in health problems in low SES groups, due to many reasons including distribution of resources, such as health care and mental health services. An explanation of this however, may be that while there is overall support for SES impacting internalising and externalising behaviours, as well as physical health, these interactions may

be separate from one another. Moreover, SES may separately impact mental and physical health, which in turn may affect each other, but SES itself may not alter the specific path from internalising and externalising behaviours to subsequent physical health outcomes.

Overall Themes and Findings

Males were found to have greater levels of both internalising and externalising behaviours in the sample. Internalising and externalising behaviours were positively correlated with each other, in line with previous research, supporting an overlap in these behaviours throughout childhood. It was discovered that higher internalising and externalising behaviours in children 4-5 years old were both indicative of greater physical health problems at 6-7 years old. This supports the biopsychosocial model, as this two-way interaction between mental health and physical health was discovered. Gender was not correlated with physical health, and additionally, did not moderate the relationships between internalising and externalising behaviours, and physical health outcomes. Interestingly, higher SES groups were associated with a negligible, negative correlation with physical health difficulties, though SES was not found to moderate the relationships between internalising and externalising behaviours, and physical health outcomes.

Practical Implications of Findings

As internalising and externalising behaviours indicated greater physical health difficulties, early intervention may be important in minimising and preventing adverse outcomes. Young children experiencing high levels of internalising and externalising behaviours could benefit from both psychological and physical health interventions, including school and community programs.

Strengths and Limitations of the Current Study

The current study encompassed many strengths, including the use of LSAC data. As the LSAC is an extensive longitudinal study that employs a wide range of data, it was a

useful study to extract data from. Furthermore, the large sample size of the study means that findings are more generalisable than smaller samples. Another strength of the current study is that it employed three physical health measures, capturing various aspects of physical health, rather than just one.

The current study also suffered from a number of limitations, including that physical health status was not extracted in Wave 1, and was only examined in Wave 2. An implication of this is that the relationships between internalising and externalising behaviours, and physical health outcomes may not have been causal relationships, and these children may have already been experiencing physical health problems in Wave 1. A second limitation of the study is that parental ratings were used, as children in the age bracket of 4-7 are too young to self-report on the current topics. An implication of parent's reporting is that they may be unaware of how a child is really feeling, however, on the other hand, they may have more insight into their child than the child him/herself.

Future Directions

An interesting area for future research would be to examine LSAC data and identify whether these physical health outcomes persist into adolescence and adulthood. It may also be beneficial to examine this relationship more closely, assessing internalising and externalising behaviours, and physical health outcomes in each wave, to discover whether internalising or externalising behaviours increase as a result of poor physical health, or vice versa.

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